IRAF NEWSLETTER

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System News

This is a short newsletter as we are busily preparing for the release of IRAF version 2.10, due out later this year . You can expect the next newsletter to more lengthy as it will contain details of the new release. IRAF version 2.10 will be a major release of IRAF and should be available for all supported hosts.

In IRAF port news, the HP-UX/IRAF upgrade to IRAF version 2.9.1 for both the Motorola and RISC architectures was completed in early December and the system is now in distribution. The first phase of the IRAF port to the Silicon Graphics Personal IRIS 2 has been completed and this system is now being tested. IRAF is up and running now on both the Macintosh under A/UX and the IBM RS/6000, although much testing remains to be done before either of these systems is ready for distribution. The Macintosh port was particularly interesting as it was done using a publically available Fortran to C translator (F2C from Bell Labs), combined with the GCC C compiler from the Free Software Foundation - essentially creating a publically available, portable Fortran compiler! This is significant because it means that portable IRAF SPP code can now be translated to either C or Fortran, depending upon what is best for a particular machine (real Fortran compilers are still faster and produce better optimized code).

The upgrade of our IRAF development system to SunOS 4.1.1 and Sun Fortran 1.3 has been completed, and the upgrade of our DECstation to Ultrix 4.1 is underway. We apologize for the delay getting some of these ports or updates underway but this work is essentially done in our spare time and has to take a back seat to our major systems development projects.

Work on support for CCD data acquisition in IRAF has been the top priority systems project for the past couple of months. Most of the attention recently has been focused on the detector and telescope control interfaces. The initial implementation of the detector control interface (DCP) uses the old 2901 based KPNO CCD controller connected directly to a Sun via a parallel interface, with detector control and readout being done directly by the Sun (rather than by the old CCD Forth system many readers who have observed at Kitt Peak or Cerro Tololo will be familiar with). This direct-to-Sun interface was pioneered by Skip Schaller of Steward Observatory. Interfaces for other detectors, e.g., the new CTIO controller and the new KPNO IR controllers are also being considered. The new interfaces are designed to allow any telescope control system or detector to be used with IRAF, given a locally written host level "driver". This project is being done as a collaboration between Steward Observatory and NOAO.

Lindsey Davis, in collaboration with Pedro Gigoux at CTIO, has completed the initial phase of incorporating the CTIO photometric calibration software into IRAF. The package is now undergoing in-house testing, and Lindsey is busily writing the documentation for the package. Frank Valdes is working on several new projects. The first of these is rewriting the IMCOMBINE task to include new combining algorithms as well as adding support for bad pixel masks. Frank is also adding world coordinate system support to all the spectroscopic packages. Two new reduction scripts have been added to the NEWIMRED package, called DOFOE and DOECHELLE (see accompanying article in this newsletter). Mike Fitzpatrick's RV0 package, a first version of the planned radial velocity package, is now undergoing intensive testing (see accompanying article in this newsletter). Please contact us for further details on the status of any of these projects.

Preparation for the astronomical data analysis software conference sponsored by the major IRAF centers (NOAO, STScI, and SAO) to be held in Tucson in early November 1991 is well underway. See the accompanying article in this newsletter.

Doug Tody

Update on Software Conference

Plans for the First Annual Conference on *Astronomical Data Analysis Software and Systems* to be held in Tucson on November 6-8, 1991 are moving right along. Preregistration material for the conference was made available with the last issue of the IRAF Newsletter. To date we have more than 200 preregistrants with more than 50 of these being from outside the United States.

During the past few months the Program Organizing Committee has been putting together the invited speakers list. The following people have agreed to give invited talks at the conference: Ed Cheng (NASA/GSFC), Tim Cornwell (NRAO), Eric Feigelson (Penn State), Nick Gautier (IPAC), Steve Murray (SAO), Fionn Murtagh (STECF), Bill Press (CFA), Larry Smarr (NCSA), Peter Stetson (DAO), Frank Valdes (NOAO), Wolfgang Voges (MPI), Nick White (HEASARC/GSFC), and Rick White (STScI).

Registration materials will be mailed out to all preregistrants in early May.

For more information about the conference send mail to *softconf@noao.edu* or *5355::softconf*.

Doug Tody
Steve Ridgway
Jeannette Barnes

Missing This Issue of the IRAF Newsletter?

The October 1990 (Number 10) issue of the *IRAF Newsletter* had a "blue" form attached to it requesting that readers who wanted to continue to receive the *IRAF Newsletter* should return this form to us, either by filling out and mailing the form, or via electronic mail. Any names and addresses that were not verified would be dropped from our mailing list.

If you did not receive this current issue of the *IRAF Newsletter* and you would like to continue to be on our general mailing list please reregister with us. The registration form is available in the IRAF network archive on iraf.noao.edu as the file REGISTER in the *iraf* directory. If electronic mail is not an option then please send regular mail to me at the address on the front of this newsletter.

Jeannette Barnes

IRAF Acknowledgment

We have been asked by several users of IRAF for a best way to acknowledge the use of the IRAF system for data reduction and analysis when preparing a paper for publication. We addressed this issue in a previous newsletter but since that time a footnote has been modified.

We suggest the following footnote for use when the name "IRAF" is mentioned in a paper:

[1]IRAF is distributed by the National Optical Astronomy Observatories, which is operated by the Association of Universities for Research in Astronomy, Inc. (AURA) under cooperative agreement with the National Science Foundation.

In the case where a more extensive discussion merits listing a published reference paper, the following paper may be listed:

Tody, D., "The IRAF Data Reduction and Analysis System", *Instrumentation in Astronomy VI*, David L. Crawford, Editor, Proc. SPIE 627, 733 (1986).

Stephen Ridgway
Manager, CCS

Modifying the Pixel Pathname

The pixels of an IRAF image are stored separately from the image header. The pathname to the pixel file is contained in a header parameter referenced as "pixfile" by the HSELECT and HEDIT tasks. Users occasionally need to modify this pixel pathname, most commonly when the disk containing the pixels has been renamed or if the pixel files have been moved en masse for system administration reasons to a new location. The following method enables you to modify a large number of image headers to contain new pixel pathnames. The technique is to first create a temporary file of image names and their current pixel pathnames using the task HSELECT. You globally edit this temporary file to contain the new pixel pathnames and then use the modified file as input to the HEDIT task.

```
cl> hselect old*.imh $I,pixfile yes > filin
cl> [do a global edit to filin and edit in the new pixel pathname]
cl> list="filin"
cl> {
    while(fscan(list,s1,s2) != EOF)
    hedit(s1,"pixfile",s2,verify-)
    }
```

Suzanne Jacoby

Setting Up Multiple Fifo Pipes for SAOimage

On UNIX systems, the IRAF DISPLAY task communicates with the image display servers through fifo pipes in /dev. The SAOimage display server runs in the X environment and IMTOOL runs under SunView. A standard IRAF installation will include only one set of fifo pipes in /dev and so there is a limit of one image server process running per machine. If more than one such process is running, there is contention for the single set of fifo pipes and the output from DISPLAY will not be what (or where) you expect.

This has not been an inconvenience for users of IMTOOL under SunView. IMTOOL itself provides 4 image display frames so running one IMTOOL process is sufficient. Also, a user always runs the IMTOOL executable on the same workstation they're using for image display. This is true if IRAF is being run remotely from a server or not, meaning IMTOOL always uses the display terminal's fifo pipes, not those on the IRAF server, and no conflict exists.

SAOimage allows for only one display frame, tempting some users to run multiple SAOimage processes to simultaneously view more than one image. Additionally, X allows you to run SAOimage on one machine (and so use that machine's fifo pipes) and have the output appear on your local workstation by setting the UNIX environment variable DISPLAY. This method of remote display uses the server's fifo pipes, not those on the local workstation or X terminal. This scenario is a common source of conflict for the fifo pipes as more than one SAOimage

process runs per machine. The solution is for each SAOimage process to have a separate set of fifo pipes as described below.

It is possible to specify the location of the fifo pipes to SAOimage on the command line. You can therefore set up a private set of FIFO pipes and avoid the public versions in /dev. The commands in the following cshell script create a private set of fifo pipes in a DEV subdirectory of the user's IRAF login directory and edit a private copy of dev$graphcap accordingly. The script needs to be run only once to initially set up the pipes; the script requires $iraf be defined in the UNIX environment. Once the new pipes and IRAF graphcap entries are created, it will be necessary to tell SAOimage to use the new pipes and to tell the CL to use the modified dev$graphcap file.

To start up SAOimage with the "new" fifo pipes, use the following command with appropriate pathname substitutions. Note that the "idev" to SAOimage is the imt1o pipe (the SAOimage input is the DISPLAY task output):

```
% saoimage -idev /mydir/dev/imt1o -odev /mydir/dev/imt1i -imtool &
```

To direct the CL to use your private copy of graphcap, put this line in your loginuser.cl file:

```
set graphcap = home$dev/mygraphcap
```

The Cshell script follows:

```
# Cshell script to configure an (IRAF) account to use personal named
# pipes for imtool/saoimage communication, rather than the public
# plumbing in /dev.

# Usage:    execute this script in your IRAF login directory.

# Comments:  a subdirectory home$dev will be created and the pipes and a
# private graphcap will be placed into that directory.  Error trapping
# is entirely ignored.  You should carefully check your directory
# configuration to verify that you aren't stomping on anything.
# Note that the unix environment variable 'iraf' needs to be defined.

# Rob Seaman, NOAO CCS, November 20, 1990.

mkdir dev
cd dev

/usr/etc/mknod imt1i p
/usr/etc/mknod imt1o p
chmod 600 imt1o imt1i

sed s+/dev/imt1+$cwd/imt1+g $iraf/dev/graphcap > mygraphcap

exit
```

This script does not address the case of a user having multiple SAOimage windows running on the same machine. In that case, you must create multiple sets of fifo pipes and modify a private copy of graphcap more extensively. Contact the HOTline for assistance with this or additional customizations.

Suzanne Jacoby
Rob Seaman

New Radial Velocity Package Availability

In the October 1990 issue of the IRAF Newsletter we summarized development plans for the Radial Velocity package. The so-called *Level-Zero* release of the new package has been in testing at NOAO since early February and early reports have been favorable. A beta test version of the package is now available as an add-on in the IRAF network archive.

Users with questions or concerns about obtaining the Level-Zero package or its future development are encouraged to contact Mike Fitzpatrick (fitz@noao.edu, 5355::fitz, or (602)-325-9387) for more information.

Mike Fitzpatrick

New ASTUTIL Task for Computing Grating Parameters

A new astronomical utility task for the ASTUTIL package has been written. It is called GRATINGS. This task computes grating parameters specified as INDEF from other grating parameters and prints the final set of self-consistent parameters. The parameters are the focal length to the detector, the grooves per millimeter of the grating, the blaze angle of the grating, the angle of incidence of the incoming light to the grating (which is required to be in the plane perpendicular to the face of the grating), the diffraction order, and the blaze wavelength and dispersion at the blaze wavelength on the detector for that order. Given any five parameters the other two parameters are computed. For example, given the physical parameters of the grating and the camera you can find the blaze wavelength and dispersion of a particular order. Alternatively, given a desired wavelength and dispersion you can compute the focal length, grooves per millimeter, blaze angle, or order. Below are two examples of the program.

The default values are for a grating of 226 grooves per millimeter in a 590 mm focal length camera. For a blaze angle of 4.5 degrees and an angle of incidence of -10.5 degrees (the angle is on the other side of the grating normal relative to the blaze angle) the first order wavelength and dispersion at the blaze peak is:

```
cl> gratings
Grating parameters:
  Focal length = 590. mm
  Grating = 226. grooves/mm
  Blaze angle = 4.5 degrees
  Incidence angle = -10.5 degrees
  Order = 1
  Blaze wavelength = 6706.696 Angstroms
  Blaze dispersion = 70.69458 Angstroms/mm
```

What is the order of 6563 Angstroms for an echelle of 31.6 grooves per millimeter with a 63 degree blaze, and a 6 degree angle of incidence relative to the blaze angle?

```
cl> gratings gmm=31.6 blaze=63 theta=69 order=INDEF wave=6563
Grating parameters:
  Focal length = 590. mm
  Grating = 31.6 grooves/mm
  Blaze angle = 63. degrees
  Incidence angle = 69. degrees
  Order = 85
```

```
Blaze wavelength = 6598.105 Angstroms
Blaze dispersion = 3.436772 Angstroms/mm
```

This task will be available in V2.10 IRAF.

Frank Valdes

New Echelle Software

Two new echelle reduction tasks have been written, one for general echelle slit data and one for the Fiber Optic Echelle (FOE) on loan to Kitt Peak from Penn State University. These tasks combine the operations of identifying and tracing the orders, extraction, flat fielding of the fiber spectra, wavelength calibration including using the arc fiber in the FOE, and flux calibration of echelle slit spectra. They are similar to the other specialized spectral reduction tasks such as DONESSIE and SPECPROC in the suite of packages currently known as NEWIMRED. The FOE task, DOFOE, is part of a new IMRED package called FOE specialized for this instrument. The echelle slit task, DOECHELLE, is part of the ECHELLE IMRED package. This software is not yet available for external use but will be eventually released as part of the NEWIMRED external package and will be part of V2.10 IRAF.

For the purposes of testing a new task for the ARTDATA package has been written to create artificial echelle images in both two dimensional and extracted formats. This task, called MKECHELLE, fully applies the characteristics of an echelle grating including the wavelength nonlinearity, single reflections at certain diffraction angles, and blaze response corrected for light lost to other orders. The echelle configuration allows for separation of angle of incidence from the blaze angle in the dispersion plane of the grating but not perpendicular to the dispersion plane; i.e "theta" != 0, "gamma" = 0 in the standard nomenclature. The cross dispersion uses a simple grating or prism model and gaussian or "slit" profiles. The characteristics of the spectra are the same as those in MK1DSPEC; that is random or line list specified absorption or emission lines, a blackbody continuum or constant continuum, and a doppler shift parameter. This task will only be available in V2.10 IRAF.

Frank Valdes

FOCAS News #5

FOCAS was successfully compiled and partially tested on a Silicon Graphics Personal IRIS workstation running the IRIX (SysV) operating system on loan to the NOAO/IRAF group. Because it is the first SysV system I have tried the main problems were with error and warning messages in the Makefile; for example ranlib is not in SysV. There was also one simple problem with an include file and a couple of minor bugs turned up. As described elsewhere, the IRAF port to this system is also in good shape as is the SAOimage display server; my work included both the standalone and IRAF configurations. Until IRAF and SAOimage are officially released FOCAS may be used in its standalone configuration and SAOimage may be obtained by special request.

A new program, TOTMAG was written to recompute the "total" magnitudes for split objects (where the magnitude is an apportionment of the parent magnitude based on the split isophotal

magnitudes to correct for light lost during splitting process) when the original magnitudes are changed. Normally the SPLITS program does this computation after the unsplit object magnitudes have been computed by EVALUATE. However, it is possible to run EVALUATE again with different parameters leading to different magnitudes. Then the recursive apportionment has to be done again. The particular situation where this is useful is when the object detection is done on one image (maybe the average of all passbands) and it is desired to use the same isophotes for the photometry on different images. This is done by copying the catalog and changing the name of the image file with SETCAT and then running EVALUATE and TOTMAG.

Because of the name conflict between the IRAF image display program and the FOCAS image display program the name in the FOCAS package when run under IRAF has been changed to FDISPLAY; this is simply an alias and when run outside of IRAF it is still called DISPLAY.

Frank Valdes

Add-on Software Available for IRAF Versions 2.8/2.9/2.9.1

The following software packages are available as add-ons to IRAF versions 2.8, 2.9, and 2.9.1. All packages are available via file transfer from the IRAF network archive on iraf.noao.edu (Internet node 140.252.1.1) in the directory *iraf.old* and have *readme* files containing instructions for transfer and installation. Unless specified otherwise please contact the IRAF hotline for further information (iraf@noao.edu).

- ARTDATA - the new artificial data package. This is available as an add-on to IRAF version 2.8 only as it is included with IRAF versions 2.9/2.9.1. See the article in the previous issue of the IRAF Newsletter (Number 10 October 1990).
- IUEECHELLE package - a prototype package to support a particular format of IUE Echelle spectra. See a discussion of this software in IRAF Newsletter Number 7 (June 1989). For further information contact Frank Valdes (fvaldes@noao.edu, 5355::fvaldes).
- NEWIMRED - the first complete release of the new spectroscopic reduction packages for a variety of KPNO/CTIO instruments. See articles in IRAF Newsletter Number 10 (October 1990) and in this Newsletter as well. Contact Frank Valdes for further information (fvaldes@noao.edu, 5355::fvaldes).
- DAOPHOT/IRAF - the IRAF DAOPHOT digital stellar photometry package. See a discussion of this software in IRAF Newsletter Number 8 (October 1989).
- The new RV0 Radial Velocity analysis package (the zero means simply that this is a level zero build, i.e., a subset of the planned full package). A beta test version of this software was released in April 1991; anyone using the original prototype version of RV should upgrade to this new, much more thoroughly tested version. Although RV0 has been carefully tested for the most common modes of usage, it is a very complex program and full testing will continue for several months. The package is currently under revision (see accompanying article in this Newsletter). Contact Mike Fitzpatrick for more information (fitz@noao.edu, 5355::fitz).
- Volume rendering software - this software has been discussed in previous issues of the IRAF Newsletter (Number 5 October 1988 and Number 6 February 1989). Contact Steve Rooke (rooke@noao.edu, 5355::rooke) for further information.
- IRAF demos - a set of IRAF demos for tasks in the IRAF and NOAO packages as well as an IMTOOL tutorial. An updated package was made available in early September. Contact Jeannette Barnes for further information (jbarnes@noao.edu, 5355::jbarnes).

- Kernel server kits - may be installed to remotely access tape drives or the workstation display via IRAF networking, as an alternative to installing or NFS mounting the full IRAF system (UNIX/IRAF hosts only). Note that if IRAF is already installed on another node in your local network which is architecturally compatible and accessible via NFS, it may be simpler to NFS mount and install IRAF than to install the kernel server kit.
- SAOimage - an X Window System based display server for IRAF developed by Mike VanHilst at the Center for Astrophysics for workstations running X11 (see article in IRAF Newsletter Number 8 October 1989).
- UISDISP display software for VMS Workstations - this software was discussed in IRAF Newsletter Number 7 (June 1989). This version is included with VMS/IRAF version 2.9. For further information please contact Nigel Sharp (sharp@noao.edu, 5355::sharp).
- Gould DeAnza IP8400/8500 display software (VMS only).

The IRAF Group