**Using IRAF for the First Time**

Last Modified: September 2020

Overview:

This document describes how to use IRAF – Image Reduction and Analysis Facility – for the first time. It presumes some basic knowledge of the *unix* or *linux* operating system, and the X-Window graphical user interface (GUI). It presumes that you are using an X-terminal or are in an X-terminal environment. (Windows/PC users could use Cygwin/X or PuTTY to run *unix*/*linux* applications in a Windows environment, while Mac users may use an X-window emulation through Quartz, for example.)

Some of the following may not be relevant during COVID-19, to run IRAF from the William Small Centre, authenticate (as usual) using your Passport York username and password. Left-click on "All Programs." You'll find two entries labelled "Cygwin/X" (and not just Cygwin which is also there). Clicking on the bottom “Cygwin/X” reveals a link to "Cosmos." By clicking on "Cosmos" a new desktop will open. Enter your Username and Password for Cosmos. (Be sure you have a Cosmos account before attempting this.)

A blue desktop will appear, with icons on the left. Right-mouse click in the blue desktop and select “Open in Terminal” option. A window will appear. Type “cd” followed by a carriage return in that window and you’ll then find yourself in your top level director on Cosmos.

At this point, you should open up 3 windows from the original window. In the original window, type “xterm &”. (The “&” stipulates that the process is run in the background.) An x-terminal window should appear. In the original window, type “xgterm &”. This opens up another x-terminal graphics window from which you will run IRAF. And finally, from the original window, type “ds9 &” which will bring up the image display utility for IRAF. Then close the original window and click on the xgterm window.

How to Use IRAF the First Time:

1. Once logged into an xgterm window successfully, make a working directory for your IRAF related files via

mkdir iraf

2. Move into this working directory via

cd iraf

3. Issue the command

mkiraf

Terminal types: xgterm,xterm,gterm,vt640,vt100,etc.

At the

Enter terminal type:

you should answer

xgterm

After you have entered this, you should see something like:

A new LOGIN.CL file has been created in the current directory.

You may wish to review and edit this file to change the defaults.

On listing (ls) the contents of you current directory, you will note the following contents:

login.cl uparm/

where login.cl is your IRAF personal login file, and uparm is a parameter directory.

Note that you can view the contents of the login.cl file via any pager – for example "more login.cl" or "less login.cl" will work in this regard.

4. IRAF can operate directly on FITS files, but it may not do so automatically. To coax IRAF into doing so, you’ll have to do one of two things: you may issue the command (each time you run IRAF)

set imtype = fits

or you may edit the login.cl file and change the line:

#set imtype = “imh”

to

set imtype = “fits”

Student accounts have storage limits, i.e., a hard disk quota. There should be plenty of room to carry out this project, but it is always a good policy to tidy up once you’ve completed various stages of data reduction. It is also wise to keep the raw and reduced (final) data on a USB drive (or other medium) for safe keeping (even though there are nightly back-ups of the Cosmos machine).

5. To test out your personal configuration, please type

cl

from the command line. After seeing your shell customizations scroll by rapidly, you should see something like

NOAO/IRAF PC-IRAF Revision 2.16 EXPORT Thu May 24 15:41:17 MST 2012

This is the EXPORT version of IRAF V2.16 supporting PC systems.

Welcome to IRAF. To list the available commands, type ? or ??. To get

detailed information about a command, type `help command'. To run a

command or load a package, type its name. Type `bye' to exit a

package, or `logout' to get out of the CL. Type `news' to find out

what is new in the version of the system you are using.

Visit http://iraf.net if you have questions or to report problems.

The following commands or packages are currently defined:

ctio. images. noao. rvsao. tables.

dataio. language. obsolete. softools. utilities.

dbms. lists. plot. stsdas. vo.

fitsutil. mscred. proto. system.

vocl> (or just cl> )

The "cl>" prompt represents the IRAF command-line interpreter. It has built-in help, available by typing "help", and various other features. The two lines above "cl" (which stands for “Command Line”) represent packages of programs that can be accessed within the cl environment. (NB: there are packages that use a more modern “front end”, but continue to use IRAF as the “back end”, i.e., IRAF provides the most mature and well-tested utilities for data reduction and analysis.)

6. To display a default image provided with the IRAF run-time distribution, all you need to do is type

cl> display dev$pix 1

On typing this command, you should see

z1=36. z2=320.0713

cl>

while your ds9 window displays the test image (“dev$pix” stands for a default 512×512 image of the face-on spiral galaxy, M51).

Note: The numeral "1" at the end of the display command, allows the images to be displayed in the first frame (of four available frames).

If this is all successful, then your set-up is properly configured. It is always best in astronomy to invert the display colour map. That is, click on "color" option at the top of the ds9 window and then "invert colormap." You can print from the "File" option in the top menu. PLEASE USE THIS OPTION SPARINGLY! You can route the output to the Computer Commons Printer where you can use your card to release it.

One of the most important options to use with “display” is “imexamine.” “Imexamine” allows the user to examine important characteristics/parameters in an image in a simple manner. For example, one you’ve “display”ed dev$pix, then issue the “imexamine” command in the xgterm window. A cursor will appear in the ds9 window. (You may have to click on the top bar of the ds9 window to activate the interactive display.) Drag the cursor over any star and type “,” (comma); important parameters about the object will appear in the xgterm window including the star’s (x,y) centroid, its peak intensity, the sky background level “under” the star, the full-width at half-maximum of the star’s profile, etc. Typing “q” exists from the “imexamine” mode. Another useful “imexamine” option is “m” which provides statistics about the sky background at any cursor location. Etc.

7. Linux commands may be used in the cl environment. For example, from the cl> prompt, one can type “ls -1 \*.fits” to list all the fits files in the working directory. To store these file names in a file abc.list, one per record, issue the command “ls -1 \*.fits > abc.list”. It is often helpful, however, to keep an xterm window open along with the IRAF xgterm window in order to issue more complicated *linux* commands.

8. To exit from the "cl>" mode, all you need to do is type

cl> logout

To close up the ds9 window, click on the "×" option at the top of the window, or "Exit" from the "File" menu. Be aware that you should exit "gracefully" from ds9 each time you use it, otherwise you spawn a lot of processes that can interfere with one another and disable displaying.

9. You will be using a number of the most basic IRAF utilities in the reduction and analysis of data (including your own data). These will be discussed explicitly in subsequent documents.