

Directories

- *Raw Images*
/amarok1/laf49/aspens/images
- *Reduction Area*
/vast/aspens/seextractor
- *Tools (Executables)*
/student/laf49/tools
- *Kurucz Models*
/chinle/laf49/kurucz

Flat & Bias Corrections

The following is performed with the use of IRAF. This can be in any directory with a login.cl file, or one must at least login into IRAF in a directory containing such a file.

- biaslist
- zerocombine
- flatlists (seperate for each filter)
- subtract(imarith) bias from @flatlist
- imstat flatlist field="mode" > modelist
- imarith @flatlist/@modelist
- objectlist
- flatcombine
- imarith @objlist - zero.fits
- imarith @objlist/flat (for specific filter)
- imcopy *.fit[1:512,1:512] *.fit

SExtractor

The following operations are performed on bohr @:
/vast/aspens/seextractor

Also will be needed by the data reduction specialist is to set their .cshrc file to find things in a directory called tool (or whatever) in there home directory. The tool box of Lucas Fuhrman can then be copied into this place. The tool box currently exists on bohr @:

/student/laf49/tools

Once this has been set up the following reduction can be eased as is outlined for all of the following sections.

- move cleaned images into a directory for the month of observations
i.e. AUG_04
- move images into separate sub directories separated by the target star name and the date of observation
i.e. AUG_04/GJ0273_0829
- now in the months directory (i.e. */vast/aspens/seextractor/AUG_04*) one can centroid each stars directory using the *sa2* command.
i.e. *sa2 GJ0273_0829*
- in order for this to run the configuration file in the tools directory (*machine.config*) must have the name of the star's list in the file.
vast/aspens/seextractor/LISTS/GJ0273.list
- If the star is new or needs a new list made the *sa4* command runs *SExtractor* with *machine4.config* configuration file. This configuration file does not use a list and will allow for a new list to be made. The new list should be renamed by the star name with a ".list" extension and moved into the lists directory (*/vast/aspens/seextractor/LISTS*).
- The centroid data files are written to the directory with the images and has a ".dat" extension. The file *param.sex* in the tools directory controls what is written to these files.

Transformation Between Coordinate Systems

IRAF is used in the transformation of the ".dat" from pixel coordinates into celestial coordinates. Files with the extension ".cc" will be written to the directory with the images. The script lives in it */vast/aspens/seextractor*

- *tranny.cl* is a script which will transform a month of image ".dat" files. For this to run one must be in IRAF (type *cl*) and then type:

```
cl < tranny.cl
```

- A prompt will appear and ask for the month to be reduced. This is the directory which will be reduced. type i.e. AUG_04 If there any complaints make sure to rid the directory of any extraneous sub directories or files (For example is later programs leave trace files, or a program was stopped in the middle and did not have a chance to clean up after itself) This will hold true for all the following scripts because often they use the *ls* or *ls -d* command to find out what exists in the directory.

Removal of Reference Star Parallaxes

At this point the ".cc" files may be operated on in order to remove the reference stars parallactic offset at the time of observation.

- A UNIX script will remove the offset of a month of images. The command is:

```
pie_runner AUG_04
```

- This will leave behind files with the extension ".pi"
- The fortran code lives within subdirectories of:

```
/vast/aspens/sextactor/pi_FACTORS
```

- The program relies on the stars having specified distances. The list of stellar distance, which can be updated, is in:

```
/vast/aspens/sextactor/TABLES/DIST.tbl
```

DCR

Once the reference stars parallactic offset has been removed, the offset of all stellar positions due to refraction must be corrected for. This is color dependent and the temperature of the star must be recorded in:

```
/vast/aspens/sextactor/TABLES/temperature.05er
```

This also relies on the color given by the spectral type in the table:

```
/vast/aspens/sextactor/TABLES/MV_VI.tbl
```

The following describes the place where the code lives and the command used to run a month of images. This requires the files with the ".pi" extension and writes files with ".fni" extension.

- The UNIX command which runs the fortran code for a month of images is:

```
DCR_runner AUG_04
```

- Executable is DCedR
- The fortran code lives in the directory :

```
/vast/aspens/sextactor/DCR/fortran_correct/
```

```
main :
```

```
DCR.f90
```

```
modules:
```

```
DCR_mod.f90
```

```
star_sort.f90
```

New Stars

- **SEXTRACTOR** – make a list using sa4 & move to:

`/vast/aspens/sextractor/LISTS/starname.list`

- **Aladin** – get coordinates & move to:

`/vast/aspens/sextractor/coodz/starname`

– good time to also make a finder chart

- **2MASS** – check coordinates (*use the coordinates from 2MASS that are the best match to the Aladdin coordinates*) and create a 2MASS photometry file which is moved to:

`/vast/aspens/sextractor/photometry/2mass_phot/starname`

- **Photometry**

If VRI exist reduce these and convert from magnitudes to Janskies First use `tranz.cl` (*found in: /vast/aspens/sextractor*) to convert to celestial coordinates to inable the code to match the target star. Enter the photometry directory and run photos which should be in the tool box

photos GJ0035

The photometry in both Janskies and apparent magnitudes will be written to the screen. This can then be entered into,

`/vast/aspens/sextractor/TABLES/T_ap_phot`

for the star of interest.

NOTE: *Be certain to not use tab completion when typing the starname after the comand. The " / " will cause an error and the program will return nothing. Any other errors given will be due to incompleteness of the tables for the star. Or if for some reason, as with all the programs, if there are symbols such as " : or *" instead of commas. The error which will be given is "unexpected syntax ...". This can be fixed with a simple script to trade the sintax. Already a few exist in the tool box, star_trader, ...*

- **Kurucz Models** – command *kurd*

In the directory:

`/chinle/laf49/kurucz`

the command " *kurd* " will loop through 20,00 models for all of the stars with band pass intensities (photometry) in the directory:

/chinle/laf49/kurucz/stars/starname-dir/photometry-for-each-star

-See the directories and files for examples

- The Kurd command will mkdir of the star name in bohr at:

/vast/aspens/sextractor/photometry/chi_sort/stars/starname

This will contain the χ^2 of the fit and the model name *temperature, metallicity, and surface gravity*.

Finding the best fit includes sorting the files written to bohr for each star. Enter the directory:

/vast/aspens/sextractor/photometry/chi_sort

The command for this is:

sortez stars/GJ0273 or *starname*

The output written to the screen will be the best fit model, the 16th best, and the 64th. Also the χ^2 will be given allowing for a monitor of the goodness of fit and the variation of fits. This will allow for the temperature, metallicity, and surface gravity to be found. This must then be manually cut and paste into the file of temperatures:

/vast/aspens/sextractor/TABLES/temperature.05er

Sort the chi sq.

output on bohr at */vast/aspens/sextractor/photometry/chi_sort* use *sortez* to do this..

sortez starname kurd writes a file to

/vast/aspens/sextractor/photometry/chi_sort/stars/starname

include the temperatures for the star in the temperature file

/vast/aspens/sextractor/TABLES/temperature.er05

- *DIST_runner*

Calculate the photometric distances for all the stars in the field and update */vast/aspens/sextractor/TABLES/DIST.tble*

- *And vola you have a new program star.*