REDUCTIONS AND ANALYSIS FOR M34 PROJECT

On the "ungrad" computers:

Step 1: Subtract mean dark and flatten all object images. Pinpoint won't work very well unless the very high bias level of the FLI camera is subtracted. Check a few frames for cosmic rays, but it's more bother than it's worth at this stage to remove them.

Step 2: Using hedit, insert OBJECT, EPOCH, EQUINOX, RA, DEC into each processed frame's header.

For OBJECT, hedit parameters look like:

```
images  =            @proclist  images to be edited
fields  =               object  fields to be edited
value   =                  M34  value expression
(add    =                   no) add rather than edit fields
(addonly=                   no) add only if field does not exist
(delete =                   no) delete rather than edit fields
(verify =                   no) verify each edit operation
(show   =                  yes) print record of each edit operation
(update =                  yes) enable updating of the image header
```

Step 3: Run "imstat" on all frames, save in a file. This check for negative numbers, etc.

Step 4: Run "chpixtype" on all processed frames, converting to type "ushort" (unsigned short integers, i.e. 16 bits).

Step 5: Upload to "teleauto" (DAA 16-inch) or "sojourner" (12-inch).

Step 5: Run Visual Pinpoint on all frames. Here are Kevin's notes:

Hi Stefan

I tried out Visual PinPoint on the 16 inch computer and figured out how to do batch processing. First you go to "Start" > "Programs" > "PinPoint Engine" > "Visual PinPoint" to start Visual PinPoint.

Now to open many files at once for batch processing, go to the "Solve Plates" tab at the bottom. Click on "add files" on the top right and browse to the folder with the fits files in it. To open one file click on the file and click "Open".

To open many files at once, hold down the "Shift" key click on the first one you want to open then click on the last file you want to open. This will select every file between the first and the last. To unselect files you don't want to import, hold down the "Crtl" key and click on the highlighted files. This will unselect them. You can also select files one at a time by holding the "Crtl" key and clicking on them. Once you have the files selected you want to open click the "Open" button on the bottom right.

To plate solve them click on the "Solve Plates" button. If the rough RA and Dec coordinates from the observing session aren't in the fits header then you will be prompted to enter them.

I'll add a section to the manual about using Visual PinPoint.
Good luck!

Kevin

My Notes:

The pixel scales need only be approximate, but a better pair of values helps a bit. For the 12-inch, it's -1.0685, 1.0669 arc sec/pixel. For the 6-inch guider on the 16-inch, use a scale of 1.24"/pixel.

I am using the Gaussian PSF in the Solve Plates tab; set the minimum flux to 10 (or less), the sigma to 3, the FWHM to 3.

At this stage, transfer the plate-solved images and the "stars" file for each image back to the "ungrads".

Step 6: Register all frames. Unfortunately, IRAF doesn't appear to have a simple integral-pixel shifting routine without resampling, so I use the task "wregister" in images.immatch to bring the files into register.

Choose a file which is well positioned as your reference frame, and transform all the other images so they all have stars in the same X, Y locations as the chosen reference frame. You will lose some stars around the edges in some frames.

Step 7: Take the file: jones_cat of M34 members that you encountered

in Assignment 1, and using the reference image as source of WCS, produce pixel coordinatesd for each star in the list.

For your convenience, a form of this catalog suitable for input to "wcsctran" in images.imcoords is attached. The RA and DEC are the first two "columns". NOTE: All remaining fields in the input file are copied to the output file without modification (IRAF help for "wcsctran"). See the "epar" menu:

```
                                I R A F
                     Image Reduction and Analysis Facility
PACKAGE = imcoords
   TASK = wcsctran

input   =            jones_cat  The input coordinate files
output  =             star_cat  The output coordinate files
image   = m34-14nov-reg-001.fit  The input images
inwcs   =                world  The input coordinate system
outwcs  =              logical  The output coordinate system
(columns=        1 2 3 4 5 6 7) List of input file columns
(units  =                  h n) List of input coordinate units
(formats=          %7.0f %6.0f) List of output coordinate formats
(min_sig=                    7) Minimum precision of output coordinates
(verbose=                  yes) Write comments to the output file ?
(mode   =                   ql)
```

Step 8: Do the same thing for the reference stars. Use "tvmark" to show the stars in either "jones_cat" or "ref_stars"

MAKE SURE THE STAR IDENTIFIERS ARE KEPT CORRECTLY

Step 9: Install the programmes and main configuration files by:

```
tar xvzf explore.tar.gz
```

Put all your FITS files (ending in .fit) into the explore main directory.

Step 10: Run script to rename FITS files for PPP run, and to set julian dates in headers. Do this one night at a time:

```
./renamem34.sh n01
```

Then bring in the *.fit files for the second night and rename those:

```
./renamem34.sh n02
```

and so on.

Step 11: Edit the file utscphot.pppin (command file for PPP):

```
set ibyte 1
set imdir /exp7h/explore/utsctest/12inch/nov04/n01_proc  <--- put in current directory
set iskysec 0
set iapis 50
set iapmax 17
set adusat 54000       <--- increase saturation to about 64000 for DAA ST-7
set iposf 4
set crsc 0.7
set isbox 15           <--- number of pixels error between frames.
set igafout 1
set npixgaf 9

pipe                                                          <-------|
m34             <---- First 3 letters                                 |
01 01           <---- night and chip (chip is aloways 01 for us)      |
001-330         <---- running index 9files 001 to 330 in this case)   |
m34ml           <---- name (example) of main list (see sample below)  |==== This is replicated for
m34ref          <---- reference star file list (all use same one)     |     each night n01, n02
                                                              <-------|     etc., with appropriate
                                                                             file numbers, etc.
quit
```

Step 12: Edit the ref_stars and star_cat files from step 7 to follow the examples:

m34ml.pos:

```
   157 m34 (n01) cr rej, nsm ths=0.70 Fri Jun  4 20:18:29 2004       <---change "157" to number os stars in star_cat.
#secinfo:sect  0               0     0     0     0           0      <--- leave
#posinfo     1     1  2048  3349          1     1  2048  3349       <---leave
    410     3    0     1000      1
    717    13    0     1000      2
    618    15    0     1000      3
    507    31    0     1000      4
  (etc.: 157 lines in this example)

                ^       ^        ^
```

```
                |_______|        |____  identifier from catalog.
                    |
               Two columns of
               garbage to be inserted
```

Do the same sort of thing for the reference
star file (in this case m34ref.pos). If you know awk,
you could adapt the script "transform_to_pppformat.awk".

Step 13: Now that you have the .pppin file and the main list and reference lists,
run PPP:

```
./pppltdao  <  utscphot.pppin
```

This generate, for every image, files ending in .mat, .pph and .gaf.

[FINAL RELATIVE PHOTOMETRY INSTRUCTIONS TO FOLLOW]