AY257 Winter 2019

Homework #2: Bias, Trim and Flat-fielding (direct imaging)

There are a number of CCD FITS files at:

http://www.ucolick.org/~bolte/AY257/HMWK2_2019

1. Use FITS header reading and editing tools (e.g. in IRAF, the tasks **hselect**, **imhead** and **hedit**) to verify that these are all obtained in the direct imaging observing mode with the B filter. Correct any inaccurate titles.

2. For each of the frames make a table of frame name, title, exposure time, telescope elevation, LRIS rotation angle and the mode of the number of counts (in IRAF: **imstat**).

3. Overscan correct and trim the frames. The frames were read out of two amplifiers on a single CCD. There is an IRAF script I have for this task in that is also in the HMWK2 directory. The script is called lrisbt_2amp.cl. To use it in IRAF, copy the script file into your IRAF directory and identify the path in your IRAF file called loginuser.cl. There is an example in the HMWK2 directory. An example Python script that will also do the overscan correction and trim for 2-amp CCD output at Lick Observatory can be modified to carry out the same tasks can be found here:

   Lick Obs overscan and trim: Python

   examples of how to set up a night's worth of observations for processing here:

   Ellie Gates Lick Observatory Python Data Reduction Procedures

4. There are flatfields from the dome, twilight and darksky in the mix. Do every check you can think of with these frames all leading to creating an appropriate flatfield frame. For example: divide domes into twilights, twilights into dark-sky frames, dusk twilights into dawn twilights, long-exposure-time frames into short-exposure-time frames. A handy trick for doing this is to use IRAF's **imdivide** or its equivalent with the option set to scale the resultant to a mean of 1.0 -- this way you can read residuals right off the images in units of percentage differences. Based on these experiments, chose a subset of the flat-field frames and experiment with the most effective way to combine them to create a flat-field.

5. Test for residual stars and galaxies in the combined flat by dividing it into a dome flat. Test for overall ability of your combined flat to flatten dark-sky data

by dividing it into the one of the Draco fields and looking for overall gradients and noise levels in the sky.