Observational laboratory 2, Assignment 2
Due date: Apr 4, 2018

Simple aperture photometry is a photometric measurement technique that uses reduced imaging data as input and yields an estimate for the amount of flux contained inside an aperture or a set of particular apertures. The apertures are defined as (usually) circular regions centered on a star of interest and surrounded by an annulus to measure the background. The total amount of light at pixel i is given by:

$$f_i = \mathcal{A}_i \left(\int_\lambda I_i(\lambda) \mathcal{Q}(\lambda) \mathcal{P}(\lambda) \mathcal{F}_i(\lambda) d\lambda \right) \Delta t + \mathcal{B}_i + \mathcal{D}_i \Delta t, \tag{1}$$

where $\mathcal{A}_i$ is gain, $\mathcal{B}_i$ is bias or readout noise, $\mathcal{D}_i$ is dark current, $\mathcal{Q}(\lambda)$ is the quantum efficiency of the detector, $\mathcal{P}(\lambda)$ is the passband response function, $\mathcal{F}_i(\lambda)$ is CCD illumination distribution, $I(\lambda)$ is the intrinsic incident light, and Δt is the exposure time.

In class we used the reduced GP And data from previous generations to do simple aperture photometry using `imexamine` and using `digiphot->apphot` photometry tasks. Now it is time to use your own acquired data of GP And and derive publication-quality photometric measurements.

1. Recap briefly how the data were reduced and provide some useful statistics on the science frames of GP And that you are using for photometry.

2. Select 10 stars of your choice to do quick photometry using `imexamine`. Make sure one of those stars is GP And.

3. If you haven't done so already, register your fits images so that stars are aligned. If your data are all acquired in the same night, registration will likely consist of a simple linear shift, otherwise you may need to rotate the images as well. It might be easier to break the dataset into multiple nights and do photometry separately.

4. Find the targets using `daofind` and visualize them using `tvmark`. Remove any spurious detections and add any obvious omissions. Explain the process in detail.

5. Run simple aperture photometry of the whole field. Then identify GP And, several comparison stars and plot their instrumental and median-corrected light curves over the course of your observation run. Phase the light curve to the period and plot that as well.

6. Comment extensively on the possible sources of error. How do your photometric results obtained with IRAF stack up against the values in astroImageJ?