ASTR 337: Homework 9

Due Date/Time: Beginning of class (7 pm), Wednesday, November 20th 2019

Project Individual Assignment

1. Combine the following functions (modify code you wrote to be in functional form where necessary) into a Python module. A Python module is a .py file that contains function definitions. You will then import your functions from your module into a Jupyter Notebook in order to reduce your datasets. All functions should be generic so that that things like wavelength, file paths, file names, etc, are inputs to functions and not hard-coded:

a. Your master bias and dark generation functions from Lab 5/Homework 6
b. Your flat field generation function from Lab 5/Homework 6
c. Your function to bias and dark subtract raw data frames and divide by a flat field, also from Homework 6
d. Your centroid/offset calculation function from Homework 7
e. Your image registration function from Homework 8

If you're unfamiliar with Python modules, download the file IntroToModules.ipynb from Moodle for a quick introduction.

2. Once you have the module together, you should be able to simply import it into a Jupyter Notebook and run through the whole sequence of reduction steps (a-e) in one line each (e.g., in the form modulename.functionname(input1, input2, band='R')) for the your FITS images. Print or display the output of each function as a sanity check as you go.

You should submit a single Python module file and a single Jupyter notebook, zipped together, to Moodle. No need to submit data files, however make sure that your code runs without having to rearrange folders, etc, relative to what we've given you.

3. Use your Python module to reduce both your group's cluster dataset and standard star dataset in two separate filters (i.e., B and V, or B and R, or V and R bands). One filter should overlap with that of your other group member(s) so you can compare the results later.

Project Group Assignment

Among your group, write a rough draft of the Procedures section for your final Project Report. Up to this point, the Procedures section should contain the following information:

1. Describe in detail the telescope and instrument that you used to collect the data (size of telescope, type of mount, camera type, pixel size, field of view, and anything else you think is relevant). Define any terms that are not used in everyday English in your own words.
2. Make a table that describes the nature of the observations. This should include, at a minimum, the following information for your target and standard star: wavelengths, right ascension, declination, exposure times, number of exposures, and total integration time.
3. Describe the conditions on the night of the observations -- seeing, moon, wind/sky conditions, etc., as estimated from your data or transcribed from your notes/narratives and the observing logs. Be quantitative and describe how you estimated these values where you can.
4. Start a rough outline that includes each step in the data reduction process up to measurement/extraction of individual stars via aperture photometry. For calibration data, sketch out the nature of different types of calibration frames, why they are needed, how they are applied, and how they affect the raw data once applied (be quantitative!). Add at least one representative figure to describe each major step in the data reduction process.

Please submit your draft Procedures section to Moodle (one per group).

Pre-Lab Reading and Questions for Week 10

Reading

Please read the following sections in Chromey:

- 10.1 - *(Photometry Introduction)* through 10.5 *(Absorption by the Atmosphere)*

Reading Questions

1. Describe in your own words the basic purpose of aperture photometry.
2. Describe the step-by-step process that leads to photometrically-calibrated images.
3. Write down three important/main points from this week's reading.
4. What concepts did you find unclear in this week's reading?