Abstract: Calibrating the Infrared Camera Clio

Begin by capturing the problem/question(s) you have been trying to address and your objective(s)

* Data isn’t linearized because of the nature of more brightness the longer the integration time is open
* So, we gotta linearize data for it to be useable and calibrated.

For this project, I had calibrate the Clio instrument using programming tools. Now, the Clio camera is an adaptive optics instrument, and it takes pictures in infrared. However, due to the nature of optics, an interesting side effect occurs when taking pictures with the instrument. When the Clio camera takes a picture, the two things we are interested is the integration time, which is basically how long the shutter is open, and the counts, which is a measurement of the amount of light gathered. The supposed relationship in the data between the integration time and counts readings should be linear, however, due to saturation from increased brightness, non-linearity appears within the data trends. Therefore, I had to write code to first calibrate the camera and then fix a separate data set with the calibration results.

Next, summarize the methods / activities pursued to address the problem

* Lots of coding
* Read in pictures through fits
* Find best fit to data through manufacturing true counts for all, and the error of those true counts compared to the desired relationship
* Apply a correction to the data based off which fit was the best fit to the data

First, I had to obtain pictures that I could calibrate with Clio. Then, I had to read them into arrays with code, with the independent variable being integration time (time the camera was open) and the dependent variable being counts (how bright a pixel was). I then found the most linear part of the data and used that as a basis of finding the most correct calibration. I then tried to find the true counts if the data was linear, and then found the true counts for second, third, and fourth order. From there, I could see which order of true counts fit the best. I then used the coefficients gained from that order, and applied to a different data set taken at the same time, and got the calibrated pictures in the end.

Next, summarize your results / accomplishments

* Learning python was hard lmao
* It took me 5 months to get one graph, and several messed up graphs and trials
* But we got it to work with two data sets (so far), so now, the data is calibrated

My biggest accomplishments revolved around 2 things. First, I learned python and saw how coding could be applied in a scientific setting. Second, I learned about the process of data collecting and how that relates to work beyond my undergraduate college career.

Finally, conclude with interpretations of those results and their significance. In the case of R&D work, science education, or science writing, conclude with your interpretations of the potential utility and impact the product / activities / articles will have.

* We corrected it!
* Show graph of corrected data
* Impact: the data is now usable. We can do science with it now
* What exactly do we do with it?

This data set is now useable because we calibrated the camera. Now, we can do more adaptive optics. We can therefore calibrate more data sets from the Clio camera and see how those calibrated sets contrast with our calibrated set.