

Applying Coordinates to M29

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I. INTRODUCTION

II. DATA ACQUISITION AND SETUP

Observations were made on at the Zaffarano Hall observation deck in Ames, Iowa (-93.64734° , 42.02996° , 342 m). The night was mostly clear and the ambient temperature was around 12°C . The moon was waning that night and had little to no effect on our sight. Observations were made using a Meade 8" reflector telescope with an SBIG ST-402ME CCD camera with internal V, B, and I filters.

Setting up the telescope was the same as previous observations made with the 8" Meade telescope at Zaffarano

Hall.

III. DATA ANALYSIS

IV. RESULTS

V. CONCLUSIONS

ACKNOWLEDGMENTS

Thank you to Dr. Charles Kerton and Brandon Marshall for their guidance and assistance in this work.

Appendix A: Observation Log

Table I: Observed 06 September 2017 by Miles Lucas and John Brandon

Time	File	N	Frames	Object	Filter	Exposure	Camera	Temp.	Notes
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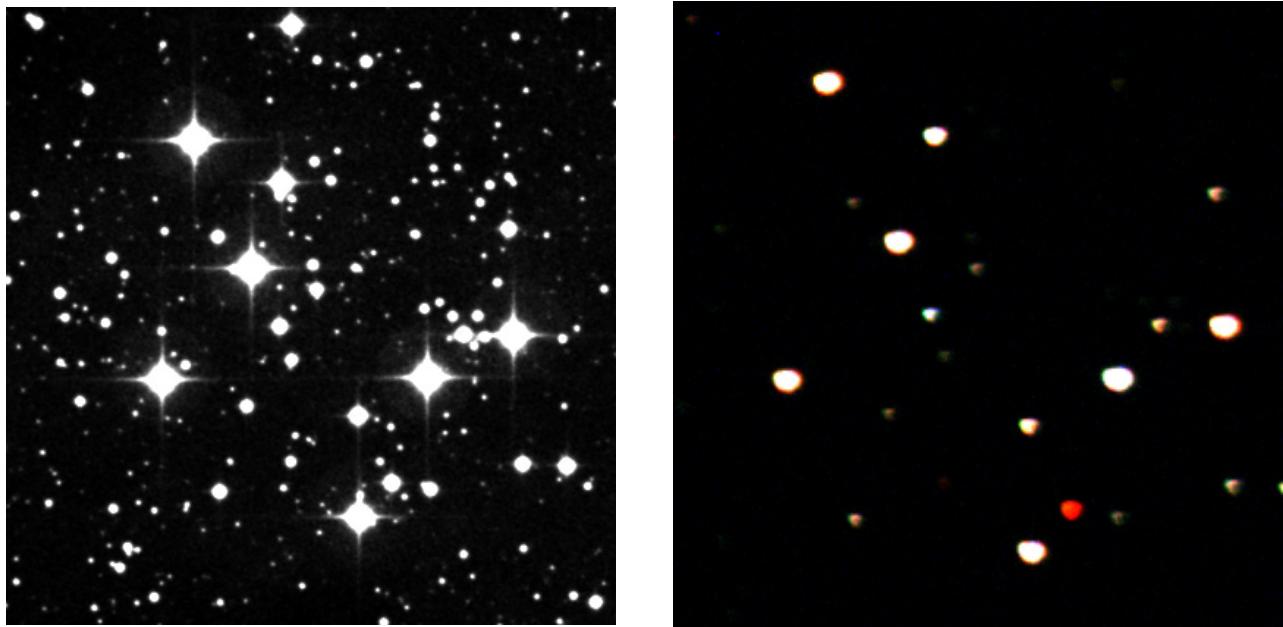
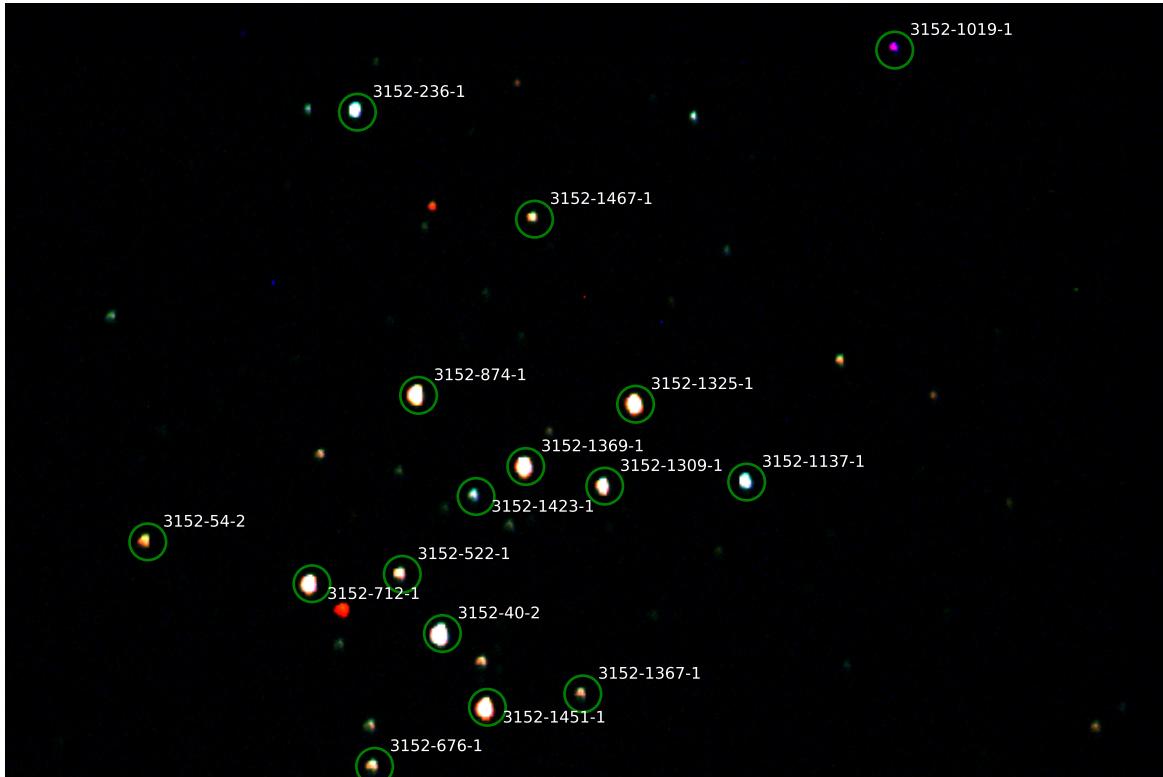


Figure 1: Images showing the location of our target and reference stars using DSS and from Zaffarano Observing Deck

Appendix B: Catalog Analysis



Appendix C: Analysis Scripts

..../src/imscale.py

```
"""
imscale.py

Author: Miles Lucas

This script parses the image scales of given images and reports a confidence interval. The images are expected to
have been coordinate-mapped using koords so that the FITS headers match the keywords

Usage:
$ python src/imscale.py data/science/processed/wcs
Pixel Scale Axis 1: 1.1646511831490212+-0.026936667803169074
Pixel Scale Axis 2: 1.1646511831490212+-0.026936667803169074
""",
```

```
import numpy as np
from astropy.io import fits
from glob import glob
import sys
from scipy.stats import norm

def get_interval(data):
    ''' Reports the 95 percent confidence interval using normal distribution '''
    mu = np.average(data)
    stdev = np.std(data)
    alpha = .05
    min_, max_ = norm.interval(1-alpha, loc=mu, scale=stdev)
    range_ = max_ - min_
    #Convert from degrees/pixel into arcseconds/Pixel
    conv_fact = 3600
    # Return an item that is x +- s as opposed to [low, upp]
    return mu * conv_fact, range_/2 * conv_fact

def main(filenames):
    ''' gets the important data from all the headers '''
    # Load the headers and get the data
    hdrs = [fits.getheader(filename) for filename in filenames]
    key1, key2 = 'CDELT1', 'CDELT2'
    cdel1 = [hdr[key1] for hdr in hdrs]
    cdel2 = [hdr[key2] for hdr in hdrs]
    # Get and print the intervals
    inter1 = get_interval(cdel1)
    inter2 = get_interval(cdel2)
    print('Pixel_Scale_Axis_1:{}+-{}'.format(*inter1))
    print('Pixel_Scale_Axis_2:{}+-{}'.format(*inter2))

if __name__=='__main__':
    if not len(sys.argv) == 2:
        print('Wrong number of arguments\nUsage: imscale.py <folderpath>')
        sys.exit()

    folder = sys.argv[1]
    filenames = glob(folder + '/*.fits')
    main(filenames)
```