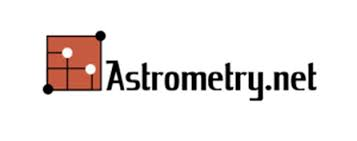
****

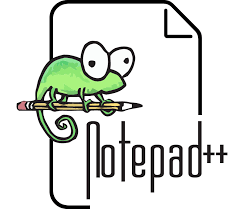
**Fisheye Data Processing Manual**

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**I. Required Software:**

1. Python 3
2. Astrometry.net account
3. Notepad++ / VS Code / other text editor
4. Git and GitHub account
5. SAOImageDS9 (optional)

**II. Setting up:**

1. Install Anaconda (<https://www.anaconda.com/>) with Python 3
2. Create an account on Astrometry.net (<http://nova.astrometry.net/>). Find the API key under the API tab. You’ll need this API key for processing the data.
3. Install Git and create GitHub account
   * Git: <https://git-scm.com/>
   * GitHub: <https://github.com/>
   * Git tutorials: <https://www.youtube.com/playlist?list=PL6gx4Cwl9DGAKWClAD_iKpNC0bGHxGhcx>
4. Fork the code from GitHub
   * Project repository:

<https://github.com/liweihung/Fisheye>

* + Introduction to Git – Branching and Merging: <https://www.youtube.com/watch?v=FyAAIHHClqI>
  + Contribute to someone's repository:

<http://kbroman.org/github_tutorial/pages/fork.html>

1. Create the following subfolders under the Fisheye folder:
   * Calibration
   * Data\_raw
   * Data\_processed

**III. Processing Flow Chart:**

1. Generate the fisheye mask: run mask.py

mask.py

**Input**

mask\_input.py

**Output**

Fisheye mask

1. Use a reference image to measure zeropoint, extinction coefficient, and pointing

**Input**

process\_input.py

raw images

flat

linearity curve

mask

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reference image

mask

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Hipparcos standards

reference image

detected\_stars.csv

latitude and longitude

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**Output**

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reduced images

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center.txt

detected\_stars.csv

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zeropoint.csv

zeropoint.png

reduction.py

astrometry.py

(client.py)

photometry.py

1. Process all the images

**Input**

zeropoint.csv

platescale.csv

reduced images

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center.txt

sky background observed sky

MF\_\*.fit

**Output**

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photometrically calibrated images

detected\_stars.csv

centering.py

(need to add distortion correction)

photometric\_calibration.py

median\_filter.py

projection.py – to be finished

fisheye.png & hammer.png

For each camera-lens combination, save the following files in Calibration\_files folder:

1. Get the flat -- Jeremy
2. Get the linearity curve -- Jeremy
3. Generate the fisheye mask
   1. Edit mask\_input.py
   2. Run mask.py
   3. Check the output file

Select a reference image in each data set:

1. Measure Zeropoint
   1. Define all fields in filepath.py
   2. Enter the file name to be used in determining the zeropoint in filepath.py under measure\_zeropoint
   3. Run reduction.py, reduced image should be saved in filepath.data\_cal
2. Measure extinction coefficient
3. Measure the image center RA and Dec

For all the images:

1. Edit filepath.py
2. (Optional)If you would like to measure the zeropoint, extinction coefficient, and the center coordinate, set measure\_reference = ‘yes’ and define the next two items: reference image and API key.
3. Data reduction
4. Centering
5. Photometric calibration
6. (Median filter)
7. Projection
8. **III. Scripts Documentation:**

* python client.py -help