

Atmospheric Transparency and Image Quality Evaluation using WiFeS Autoguiding Camera

Project Proposal

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1. PROJECT DESCRIPTION

The project aims to develop a methodology and corresponding codebase capable of analysing acquisition images captured by the WiFeS autoguiding camera at the ANU 2.3-meter robotic telescope. These images, primarily used for target acquisition, present a unique opportunity to assess atmospheric conditions at the start of science exposures. By evaluating the atmospheric transparency and image quality, or "seeing," the project seeks to contribute valuable insights for observational astronomy, enhancing the understanding and interpretation of celestial phenomena.

2. OBJECTIVES

The project's primary objectives include:

1. Learn to manipulate FITS files and use standard astronomy software packages.
2. Calculate magnitude offsets (and zero-point) using a cross-matched catalog and create a Point Spread Function (PSF) model using detected point-like sources in the image.
3. Estimate the seeing using the above multiple measures.
4. Developing a robust pipeline for consistent image reduction and seeing estimation.
5. The output of this pipeline can be used by WiFeS pipeline to append seeing information into the output images.
6. Provide software documentation and unit tests.
7. Present a report explaining the chosen processes.

3. METHODS

We use Modular Image Reduction and Analysis Resource (MIRAR¹) developed by Robert D. Stein and Viraj Karambelkar at Caltech, as our codebase. Our MIRAR-compatible pipeline uses modules from photutils² for performing various subroutines (see Fig. 1).

The pipeline has been designed with deployment in mind, incorporating a monitoring algorithm from MIRAR, watching for incoming data to provide real-time seeing estimates.

¹ <https://github.com/winter-telescope/mirar>

² <https://photutils.readthedocs.io/en/stable/>

WiFeS Autoguider Pipeline

- Default MIRAR module
- MIRAR data type
- photutils module/function/object
- Added MIRAR module
- Yet to be implemented MIRAR module
- Some subroutine(s) have been modified

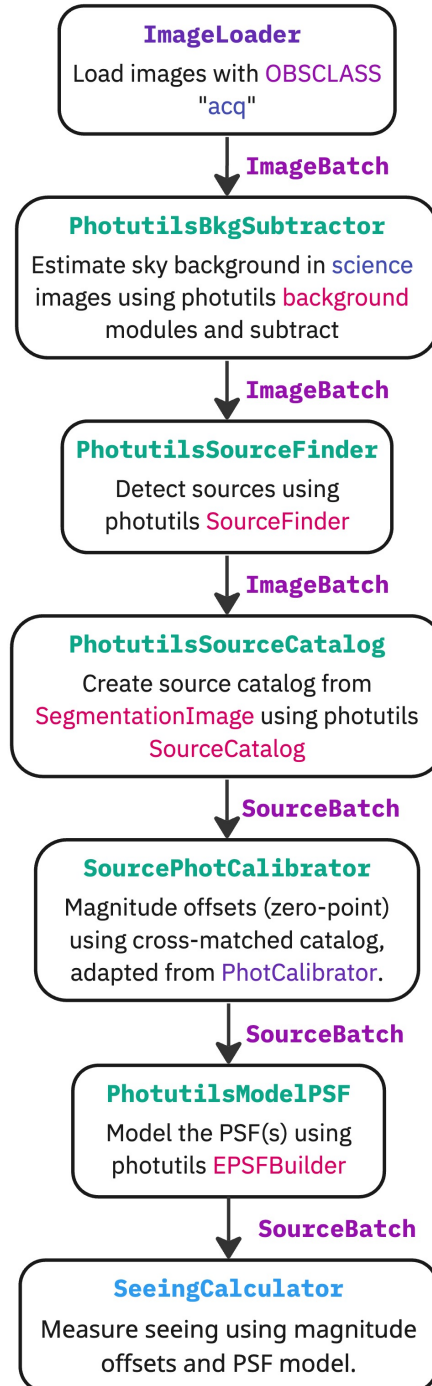


Fig. 1: Proposed data reduction and analysis pipeline to determine seeing using acquisition images from WiFeS autoguider camera.