Spectroscopic Data Reduction Pipeline for the Goodman High Throughput Spectrograph.

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1. Introduction

The Goodman High Throughput Spectrograph (Goodman Spectrograph) [1] is a highly versatile instrument in operation at the SOAR Telescope on Cerro Pachón, Chile. It is capable of doing low to mid-resolution spectroscopy in a range from 3200 Å to 9000 Å. The data reduction pipeline is conceived as an easy-to-run software, that can process an entire night worth of data by execution of a simple command, with the least amount of arguments, from a terminal window. It is written almost entirely in Python, following several Python standard conventions. We aim towards using exclusively standard Python packages, such as Astropy and Astropy-affiliated packages, while at the same time allowing for fast and efficient computing. In its present form the pipeline produces fully reduced, wavelength-calibrated spectra. Flux calibration will be an add-on option for a later release.

2. Scripts

To describe a molecule, DeCAF substitutes its functional groups with pharmacophoric points (hence the "F" in the algorithm's name). Points are organised into an undirected graph. Lengths of the edges in the graph represents the number of bonds between pharmacophoric points.

3. Future Work

The TODO list is large and the users and community input is very important to help us decide were to focus our efforts. A list of the most prominent changes are listed below. From the software point of view:

Structure: The current static structure is confusing. There is a development version that includes a modified static structure more according to an Astropy Affiliated Package.

Tests: Implement integrated test code.

Workflow: Review the current workflow and propose an update.

User Manual: Although we have a fully functional user manual we need feedback regarding how clear it is for non-regular users.

From the scientific point of view:

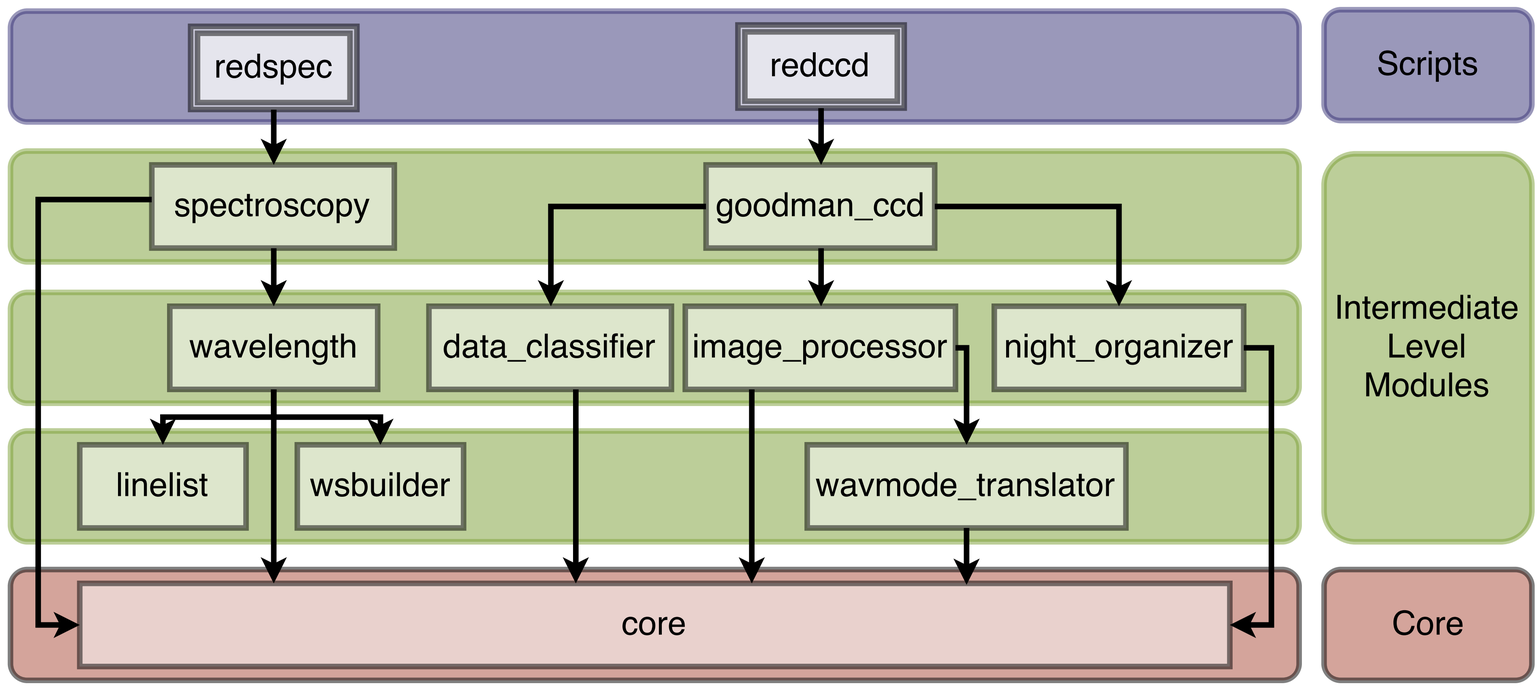
Extraction: The current spectrum extraction is in fact a simple sum of counts in a rectangular region. We will implement fractional pixel extraction as well as the Optimal Extraction algorithm [3] [2].

Operation: We are planinig to develop a *Live reduction pipeline* that can process data as it comes from the telescope that will allow observers to take quick decisions.

Telemetry: Knowing how the pipeline and instrument behaves is very important to prevent failures. We are developing a system to store the parameters of the wavelength solution polynomial with the intention to validate new solution and eventually detect problems with the instrument.

4. Pipeline Concept

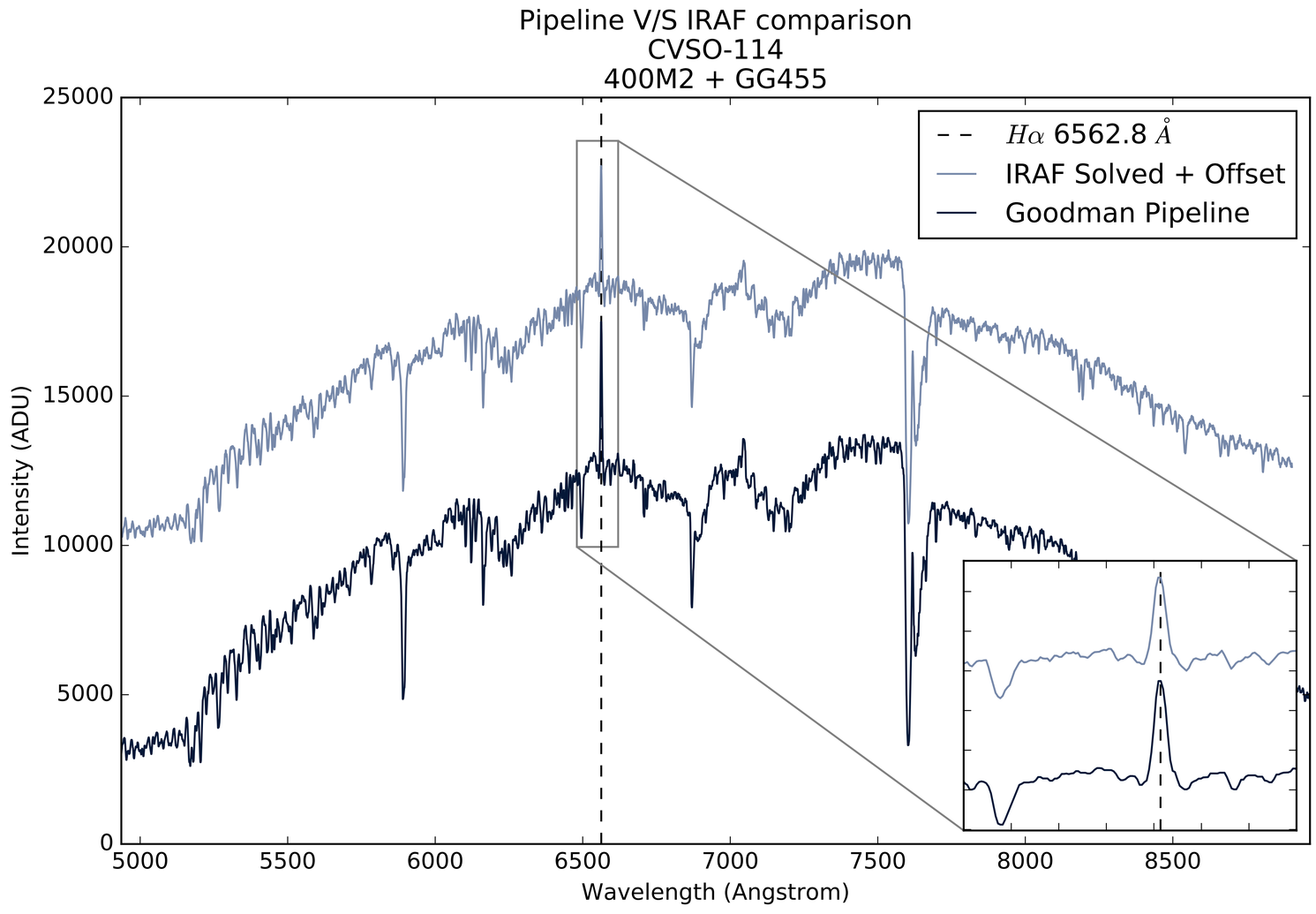
We aimed to develop an easy to use software. A user should be able to run it with the least amount of command line arguments yet it should allow a large enough flexibility to be usable in a wide range of configurations just as the Goodman Spectrograph does. Also it should be built as a library in order to reuse the code.



5. Performance

d	Automatic	Interactive
RMS Error	-	4
Time	1	1

6. Results



7. References

[1] J. C. Clemens, J. A. Crain, and R. Anderson. The Goodman spectrograph. In *Ground-based Instrumentation for Astronomy*, volume 5492 of *Proceedings of SPIE*, pages 331–340, September 2004.

[2] K. Horne. An optimal extraction algorithm for CCD spectroscopy. *PASP*, 98:609–617, June 1986.

[3] T. R. Marsh. The extraction of highly distorted spectra. *PASP*, 101:1032–1037, November 1989.