

CROSS-PLATFORM AUTOMATED SPECTRAL DATA REDUCTION APPLICATION OPTICON H2020 PROJECT (WP13-NA4)



Marco Lam
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GOAL

- ❖ Provide a publicly available spectral data reduction software
- ❖ Allow facilities with limited budget and staff-power to build their data reduction pipelines with ease
- ❖ Facilitate rapid scientific outcomes
- ❖ Provide a customisable interactive graphical user interface
- ❖ Cross-platform
- ❖ Automated Spectrophotometric Image REDuction pipeline (**ASPIRED**)

GOAL

- ❖ Provide publicly available spectral data reduction software
- ❖ Allow for easy integration of new data to build their data reduction pipeline
- ❖ Facilitate rapid scientific outcomes

Maximal Code Reuse

Self-consistent Frontend and Backend

- ❖ Automated Spectrophotometric Image REDuction pipeline (**ASPIRED**)

DEV-PROTOTYPE

Web-based and Stand-alone
Both with a Python backend

Mutual

- ❖ jQuery (Interactivity)
- ❖ JS9 (JavaScript version of DS9)
- ❖ HTML5 + CSS3 (Bootstrap)



JavaScript

- ❖ Electron.js (Chromium + Node.js)
- ❖ Electron-forge (packaging app)
- ❖ Npm (JS package manager)



Python

- ❖ Django (server) + Pywebview (browser)
- ❖ Py2app (packaging app)
- ❖ pip3 (python package manager)



FINAL DEVELOPMENT STACK

- ❖ Electron.js (Chromium + Node.js)
- ❖ Electron-forge (packaging app)
- ❖ Npm (JS package manager)
- ❖ jQuery (Interactivity)
- ❖ JS9 (JavaScript version of DS9)
- ❖ HTML5 + CSS3 (Bootstrap)
- ❖ GitHub (Version Control)
- ❖ Travis CI (Continuous Integration)
- ❖ **Python 3 (Object-Oriented, backend)**



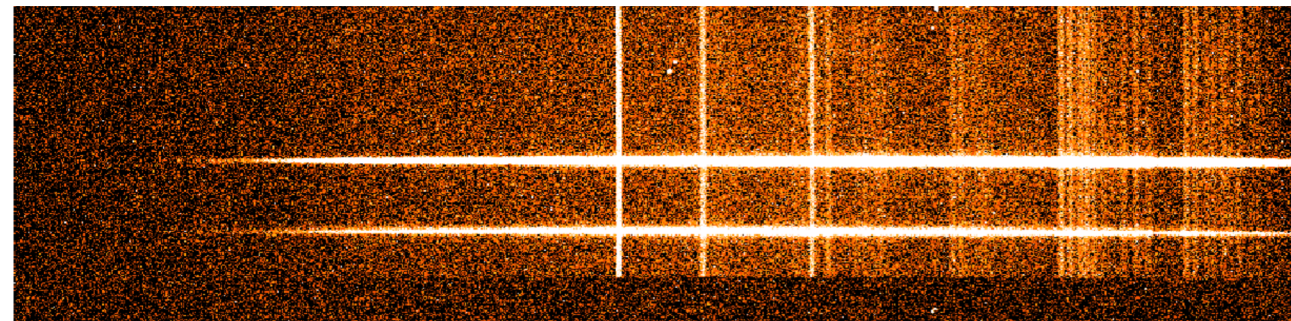
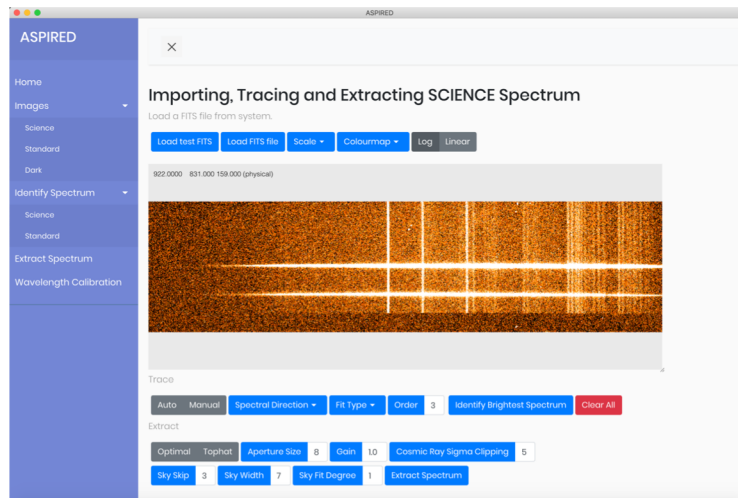
IMMEDIATE TARGETS

- ❖ A new pipeline for LT/SPRAT & LT/FRODOSpec
- ❖ A new pipeline for the SPRAT-2 (expected first light April 2020)
South African Astronomical Observatory



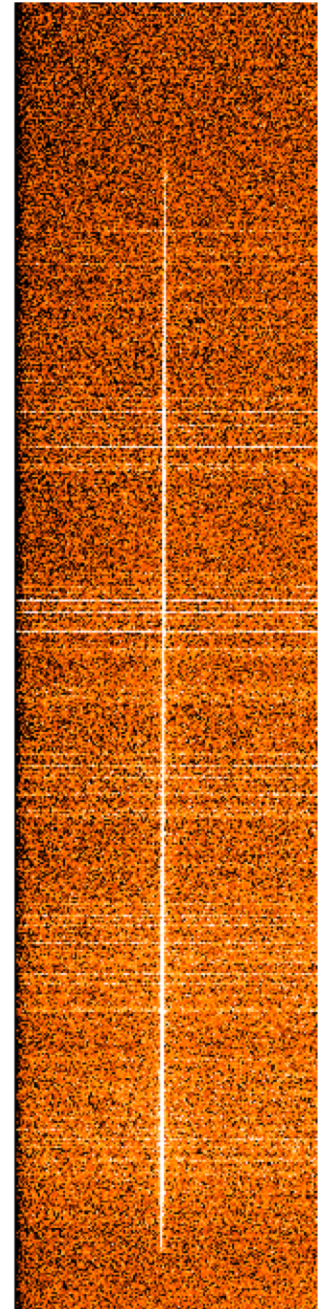
DEMO

- ❖ ipynb example of data reduction for LT/SPRAT (M2 Dwarf, R~300, Xe arc)
- ❖ ipynb example of data reduction for WHT/ISIS (Featureless WD, R300R, CuAr+CuNe arc)
- ❖ Current view of the GUI



LT/SPRAT

GUI: gASPIRED



WHT/ISIS

TIMELINE AND FUTURE WORK

❖ Planned

- ❖ Provide documentation via readthedocs.io
- ❖ Beta version by the end of January 2020
- ❖ Deployed pipelines by March 2020

❖ Future Work

- ❖ Comply with [Astropy](https://astropy.org) spectral object
- ❖ Complete the front-end development

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Future Maintenance?

TO FIND OUT MORE

❖ Data Reduction

❖ <https://github.com/cylammarco/ASPIRED/>

❖ Arxiv: 1912.05885

❖ Wavelength Calibration

❖ <https://github.com/jveitchmichaelis/rascal/>

❖ Arxiv: 1912.05883



BACKUP SLIDES

EXAMPLE ELECTRON.JS APPLICATIONS



WordPress

Skype

WordPress Desktop

Slack Desktop

GitHub Desktop

Basecamp 3

WhatsApp Desktop



GitHub



Basecamp



ASPIRED

Home

Images ▾

Science

Standard

Dark

Identify Spectrum ▾

Science

Standard

Extract Spectrum

Wavelength Calibration



Importing, Tracing and Extracting SCIENCE Spectrum

Load a FITS file from system.

Load test FITS

Load FITS file

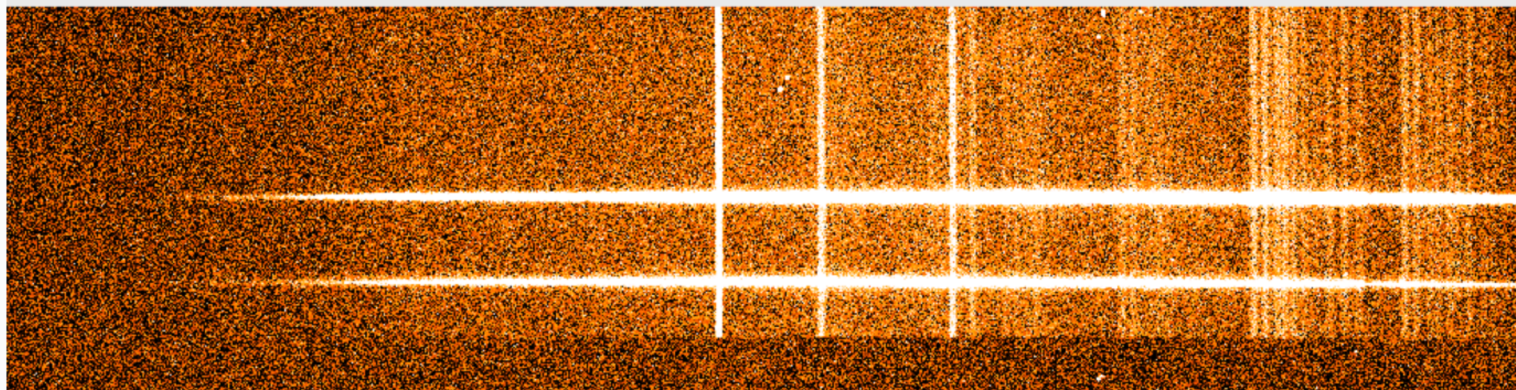
Scale ▾

Colourmap ▾

Log

Linear

922.0000 831.000 159.000 (physical)



Trace

Auto

Manual

Spectral Direction ▾

Fit Type ▾

Order

3

Identify Brightest Spectrum

Clear All

Extract

Optimal

Tophat

Aperture Size

8

Gain

1.0

Cosmic Ray Sigma Clipping

5

Sky Skip

3

Sky Width

7

Sky Fit Degree

1

Extract Spectrum

package.json

- ❖ Used by npm
- ❖ Semantic Versioning
- ❖ Define the landing “page”
- ❖ Define arguments for npm
- ❖ Define dependencies, need URL if not managed by npm

```
{  
  "name": "ASPIRED",  
  "productName": "ASPIRED",  
  "version": "0.1.0",  
  "description": "Automated SpectroPhotometric Image REDuction",  
  "main": "src/index.js",  
  "scripts": {  
    "start": "electron-forge start",  
    ...  
    ...  
  },  
  ...  
  ...  
  "dependencies": {  
    "@fortawesome/fontawesome-free": "^5.7.2",  
    "bootstrap": "^4.3.0",  
    "electron-compile": "^6.4.4",  
    "electron-squirrel-startup": "^1.0.0",  
    "fix-path": "^2.1.0",  
    "jquery": "^3.3.1",  
    "js9": "git+https://github.com/ericmandel/js9.git",  
    "popper.js": "^1.14.7"  
  },  
  ...  
  ...  
}
```

index.js

```
import { app, BrowserWindow } from 'electron';
```

```
const path = require('path')
```

```
const url = require('url')
```

```
const fixPath = require('fix-path');
```

```
fixPath();
```

Specific to MacOS

```
let mainWindow;
```

```
const createWindow = () => {
```

```
  mainWindow = new BrowserWindow({
```

```
    [some parameters]
```

```
  });
```

```
mainWindow.loadURL(url.format({
```

```
  pathname: path.join(__dirname, 'index.html'),
```

```
  protocol: 'file:',
```

```
  slashes: true
```

```
})))
```

Serving the html

```
mainWindow.once('ready-to-show', () => {  
  mainWindow.show()  
})
```

```
mainWindow.webContents.openDevTools();
```

```
mainWindow.on('closed', () => {
```

```
  mainWindow = null;
```

```
});
```

```
};
```

```
app.on('ready', createWindow);
```

```
app.on('window-all-closed', () => {
```

```
  app.quit();
```

```
});
```

```
app.on('activate', () => {
```

```
  if (mainWindow === null) {
```

```
    createWindow();
```

```
  }
```

```
});
```

.travis.yml

Setting up the system

```
sudo: enabled
dist: trusty
language: node_js
node_js: "6"
os:
  - linux
  - osx
osx_image: xcode8.3
cache:
  directories:
    - node_modules
    - $HOME/.cache/electron
```

Configure before installing packages

```
before_install:
  - if [ $TRAVIS_OS_NAME = linux ]; then wget -nc
    https://dl.winehq.org/wine-builds/winehq.key; fi
  - if [ $TRAVIS_OS_NAME = linux ]; then sudo apt-key add
    winehq.key; fi
  - if [ $TRAVIS_OS_NAME = linux ]; then sudo apt-add-repository
    'deb https://dl.winehq.org/wine-builds/ubuntu/ trusty main'; fi
  - if [ $TRAVIS_OS_NAME = linux ]; then sudo apt-get update; fi
  - if [ $TRAVIS_OS_NAME = linux ]; then sudo apt-get install
    --install-recommends winehq-stable; fi
```

Packages

```
addons:
  brew:
    packages:
      - fakeroot
      - rpm
      - dpkg
      - wine
  apt:
    packages:
      - fakeroot
      - rpm
      - dpkg
  install:
    - npm install
    - npm update
```

Run!

```
script:
  - electron-forge make --target=linux,darwin,win32
```