Subject: wavelength calibration
Posted by sid on Sat, 20 Feb 2010 05:38:35 GMT
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Hi,
Please give some tips and suggesions on wavelength calibration for spectral data
regards
sid

Subject: Re: Wavelength Calibration
Posted by Nikola on Sat, 23 Jul 2011 07:57:28 GMT
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On Jul 22, 9:08 pm, Gray <graylikethec...@gmail.com> wrote:
> Hi all,
>
> I've been beating my head against the wall trying to get this to work
> for two days... so I figured I'd head on over here and see if anyone
> could help.
>
> I'm trying to perform wavelength calibration for my near-infrared
> spectrum (2-2.4 microns). My tools:
>
> 1) A Neon-Argon arc lamp spectrum.
> 2) A list of NIR lines for Neon and Argon.
>
> Any suggestions? Thanks in advance!
>
> --Gray

Could you please specify more details? Is the observed spectrum in low resolution so that you don't see the lines? Or the problem is that you do not know the relative strengths of the Ne and Ar lines?

In principle, once you have the continuum normalized, you have to fit only coefficients of polynomial: lambdareal = a+b*lambdaobserved +c*lambdaobserved^2+... So, the problem can be linearized and the least square method is applicable. For my purposes linear relation is always sufficient, though my wavelength range is usually narrower.

Nikola

Subject: Re: wavelength calibration
Posted by Jeremy Bailin on Tue, 01 Nov 2011 19:24:37 GMT

On 11/1/11 10:08 AM, Gray wrote:
> Hello IDL gurus,
>
> I have a night-sky emission spectrum (from my data), and a list of
> irregularly-gridded night-sky lines (from the literature). I'm trying
> to perform a wavelength calibration of my data; I have a quite poor
> zeroth-order solution already.
>
> My best idea so far was to perform a cross-correlation of the two data
> sets to find the wavelength shift and then do some least-squares
> fitting to find a better solution. However, I'm not sure how to
> perform the cross-correlation.
>
> My data is in the form:
> (a) n-element array of spectrum data points
> (b) n-element array of zeroth-order wavelengths
> (c) m-element array of night-sky emission line wavelengths (irregular)
> (d) m-element array of night-sky emission line strengths
>
> So my questions are:
> 1) How do I compute the cross-correlation between these two sets of
> data?
> 2) Is this the best way to go about it?
>
> Thank you as always...
> --Gray

If you want to go the cross-correlation route, you should probably create a fake spectrum from your wavelength table that has single-pixel peaks of the amplitudes (d) at the locations (c), resample them both to a higher identical spectral resolution, and then cross-correlate those.

As for a better solution, you could try specifying a mapping function lambda_true(lambda_0) that's perhaps a simple polynomial and use that to map the wavelengths (b) before doing the resampling step, and then maximize the cross-correlation-max-amplitude with respect to the parameters of the polynomial.

-Jeremy.

Subject: Re: wavelength calibration
Posted by Brian Wolven on Tue, 01 Nov 2011 19:41:45 GMT

The approach I've used is to perform a windowed cross-correlation of the observed spectrum with

a synthetic spectrum, e.g., one generated from a line list. The exact window shape and size would depend on what your spectra look like; mine are essentially gaussians centered on the positions of the known strong emission lines. I then perform a low-order polynomial fit to the wavelength/spectral bin coordinate pairs obtained from the set of cross-correlations. In order for this approach to work well you need to have a pretty good handle on your instrument's line shape/PSF, as you'll probably want to convolve that shape with your synthetic line positions before doing the cross-correlation.

Subject: Re: wavelength calibration
Posted by rogass on Thu, 03 Nov 2011 20:05:26 GMT
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On 1 Nov., 15:08, Gray <graylikethec...@gmail.com> wrote:
> Hello IDL gurus,
>
> I have a night-sky emission spectrum (from my data), and a list of
> irregularly-gridded night-sky lines (from the literature). I'm trying
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> data?
> 2) Is this the best way to go about it?
>
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> --Gray

Hi,
2) it depends on :)

Just look for smile correction, e.g.:

with known endmember:

Guanter, L., Segl, K., Sang, B., Alonso, L., Kaufmann, H., Moreno, J.

(2009): Scene-based
spectral calibration assessment of high spectral resolution imaging
spectrometers. - Optics
Express, 17, 14, 11594-11606, DOI: 10.1364/OE.17.011594

with atmospheric absorptions:

Richter, Rudolf und Schläpfer, Daniel und Müller, Andreas (2011)
Operational atmospheric correction for imaging spectrometers
accounting for the smile effect.
IEEE Transactions on Geoscience and Remote Sensing, 49 (5), Seiten
1772-1780.
IEEE. DOI: 10.1109/TGRS.2010.2089799.

It's pretty simple to implement. Just use SHARP features.

Cheers

CR