

WP7, Task 2

Server conversion libraries from
spectra native format to IVOA
SED format

Intent

- The problem
 - SSA allows for spectra in “native” FITS format
 - a multitude of different conventions
 - tools need to cope with all these conventions
- The solution
 - convert “native” spectra to Spectrum DM, on the server-side
- Test setup
 - Using VOSpec as a FITS reader
 - Data samples: ESO and Starlink

Investigation (1)

- Data formats
 - Flux
 - “1-d” image on primary HDU
 - naxis = 1, naxis1 = n
 - 1-row “2-d” image on primary HDU
 - naxis = 2, naxis1 = n, naxis2 = 1
 - Wavelength
 - $(i - \text{crpix1}) * \text{cdelt1} + \text{crval1}$
 - $i = 1..n$
 - Error information not covered

Investigation (2)

- Metadata
 - Required for data transformation:
 - naxis, naxis1
 - crpix1, cdelt1, crval1
 - Essential
 - cunit1 (Wave unit), bunit (Flux unit)
 - multiple syntaxes (A, Angstrom, erg/cm²/s/A, erg/cm²/A/sec, erg/cm²/s/angstrom,... *ad infinitum*)
 - Spectrum DM compliance
 - At ESO, metadata lives in a DB
 - Other providers might have it in other forms

Design (1)

- Two steps
 - Transformation of data into a binary table with columns for wavelength and flux
 - Add metadata
- Split personality
 - Canonical conversion
 - Site customisation

Design (2)

- Canonical conversion (transformation step)
 - Primary header: keywords copied over “as is”
 - Canonical conversion assumes “strict adherence to common practice”
- Site customisation:
 - Transformation step: fixing the units
 - BUNIT contains an embedded scaling factor
 - Wavelength unit in “WAT1_001” keyword
 - Wavelength unit is implicit (i.e., in RTFM); at ESO, Angstroms
 - Syntax discrepancies (e.g. cm2 → cm²)
 - Metadata step (adding SpectrumDM keywords)
 - for ESO data, DB-based metadata
 - For other providers?

Status (1)

- Proof of concept:
 - Python transformation CGI
 - or CLI (I use it for testing)
 - Input:
 - URL pointing to a 1d image
 - Output:
 - SED recommended FITS (i.e., BINTABLE with 1 row for 1 spectrum);

Status (2): Issues

- Units
 - no one follows the IAU recommendation of using only SI
 - still no IVOA recommendation
 - tools do an (undocumented) best effort

Next steps

- Massive test against all ESO reduced spectra
- Generalise the process of adding Spectrum DM metadata (Coverage, sampling, curation, etc.) as a configuration
 - sources might be FITS mapping, database, ...?
- More FITS samples?
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