VIRTUAL ASTRONOMICAL OBSERVATORY

Image Data Model – Oct2012 WD

Doug Tody, NRAO, USVAO

Requirements for Image DM

- Consistent with other VO Models
  - Image, Spectrum, TimeSeries etc. should have common core model
  - Should be consistent with Obscore and Char
  - The SpectralDM could be used as core model for Image

- Consistent with current astronomical usage
  - e.g. FITS image, WCS
  - data will be predominantly returned as FITS images

Dataset	General dataset metadata
DataID	Dataset identification (creation)
Provenance	Instrumentalm or software Provenance
Curation	Publisher metadata
Target	Observed target, if any
CoordSys	Coordinate system frames
Char	Dataset characterization
Mapping	Dataset Axes Mapping or WCS
Characterization Metadata	
Char/FluxAxis	Observable, normally a flux measurement
Char/SpectralAxis	Spectral measurement axis, e.g., wavelength
Char/TimeAxis	Temporal measurement axis
Char/SpatialAxis	Spatial measurement axis
Char/Polarization	Polarization Axis
Char/*.Coverage	Coverage in any axis
Char/*.Resolution	Resolution on any axis
Char/*.SamplingPrecision	Sampling or Precision on any axis
Char/*.Accuracy	Accuracy and error in any axis
Mapping metadata	
Image matrix mapping	
WCS Mapping	

Elements of Image DM

- Generic/Common Dataset Metadata
  - Use SpectralDM for core?
- Association in query response
  - Large cubes may be split into subcubes
    - e.g., one per spectral band (common for ALMA data)
  - 2D projections of a cube
  - Use data linking to point to non-image elements

Elements of Image DM

- Image specific
  - image geometry, depth, etc. (TBD)
- Mapping (WCS)
  - Essentially a VO rendition of FITS WCS
- Char support for visibility data
  - Visibility “axis” of Char model
  - Characterize the visibility dataset

UTYPE	Description	Req	Default
Image Matrix Transform			
Mapping.NAxes	Number of image axes		
Mapping.NAxis[]	Length of each axis in pixels		
Mapping.CoordRefPixel[]	Reference pixel		
Mapping.CoordRefValue[]	WCS value at reference pixel		
Mapping.CDMatrix[]	Coord definition matrix		
Mapping.PCMatrix[]	Coord definition matrix		
Mapping.CDelt[]	World coord delta per pixel		
Mapping.AxisMap[]	Image-to-WCS axis mapping		
Mapping.WCSAxes	Number of WCS axes		
World Coord Transform			
Mapping.SpatialAxis.CoordType	Coordinate type as in FITS		
Mapping.SpatialAxis.Projection	Celestial projection		
Mapping.SpatialAxis.CoordFrame	Spatial coordinate frame		
Mapping.SpatialAxis.CoordEquinox	Coordinate equinox (if used)		
Mapping.SpatialAxis.CoordUnit	Unit for coordinate value		
Mapping.SpatialAxis.CoordName	Axis name (optional)		
Mapping.SpectralAxis.CoordType	Coordinate type as in FITS		
Mapping.SpectralAxis.Algorithm	Algorithm type as in FITS		
Mapping.SpectralAxis.RestFreq	Rest frequency of spectral line		
Mapping.SpectralAxis.RestWave	Rest wavelength of spectral line		
Mapping.SpectralAxis.CoordUnit	Unit for spectral coordinate value		
Mapping.SpectralAxis.CoordName	Axis name (optional)		
Mapping.SpectralAxis.CoordValue[]	Spectral value/band at pixel index		
Mapping.TimeAxis.CoordType	Time scale (UTC, TT, TAI, ...)		
Mapping.TimeAxis.CoordUnit	Time unit		
Mapping.TimeAxis.CoordName	Time axis name (optional)		
Mapping.TimeAxis.CoordValue[]	Time value at pixel index		
Mapping.TimeAxis.RefPosition	TOPOCENT, BARYCENT, ...		
Mapping.PolAxis.CoordType	Polarization system (Stokes etc.)		
Mapping.PolAxis.CoordName	Polarization axis name (optional)		
Mapping.PolAxis.CoordValue[]	Polarization type at pixel index		

Visibility Data

- Characterization
  - Pointing, FOV
  - UV distance plot
    - min/max UV distances, number of antennas, duration of exposure
  - Dirty beam plot
    - FWHM axes, max sidelobe expressed as % of peak
  - Freq sub-bands observed
    - support for velocity units (convention, ref frame, rest freq)
  - Resolution
    - size of synthesized beam (major, minor axes and angle)
  - Flux density, Jy/beam
  - Sensitivity, rms noise
  - Properties of possible generated images/spectra as ranges