Exploring the Handling of Light Curves in VO tools

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Time Series Requirements

TIME SERIES STANDARD IS CRUCIAL FOR FUTURE !
  (LSST, LIGO..)   Every will buy it !

Why the   IVOA does not have it ?? (Astroinformatics
  Dubrovnik, COST Big-Sky-Earth, Lyon, Geo – seismology)
=> VO Sucks, Should be burried !

This was required in TS demos (Enrique)
And Science use cases:

http://wiki.ivoa.net/twiki/bin/view/IVOA/CSPTimeSeries

- Period, RV curve, Frequency, Power Spectrum
- Combine light curves by FILTER (colour, hardeness...)
- For one or multiple objects
- ERROR bars, , LINKS to filter transmission curve

WHAT is MISSING ??

Client on Light Curve (Photons)

What the CLIENT should do, if it gets TS ?

- Analyze axes – orientation + print label (Time, Phase …)
  - UCD will tell it
- Analyze units – IF it is magnitude – reverse (preferably Y)
- Change representation – rather points (cross, plus)
- Error bars – switchable (default, preset)
- (Colors – user definable for given FILTER)

Advanced Requests on Client

If there is a PERIOD - compute phase and fold data to it

What if there are more periods (Asteroseismology) ?????

- Selectable in some menu ?

- Dynamic list (pointers ???)

- User entered values ? (to find better than computed)

Should it do the same client ? (UNIX philosophy + SAMP)

PERIOD 04 – has SAMP (but ..)

Is THIS ALL the community needs ?

Quality Control/ Assesment

HOW the light curve was created ?
Provenance

- This point is weird – what was in the original data ?

- This star in this image was by bad luck at the hot pixel

- Is it REALLY the SAME star ?   (Xmatching problems)

Combine POSITION , TIME, VALUE (PDF) in judgment

Show star on original image by clicking on light curve point!

Danish 1.54m at La Silla robotized in Summer 2012

OSPS (Ondrejov Southern Photometry Survey)
use unused part (99%) of data
lightcurves on the click .... Updating after recalibration

OSPS Dynamically created Light Curves

Go RELATIONAL !

Reduction PIPELINE (astrometry, aperture photometry)

            Munipack – F. Hroch, Masaryk university, Brno

FITS header + bintable extensions

FILTER, TIME (HJD), instrument, T, p, airmass, LINKS to images

BINTABLE for every star: alpha, delta, mag, flux, errors ..

Ingest in database (several tables in PostgreSQL)

Create unique ID (advanced clustering – J. Nádvorník) INDEX

Table wrapped as Spectrum (SSA) in DaCHS (FILTER=BAND)

Use Datalink to create on-the fly votable (query in RT)

WHAT Client ? Who will write it ?

Main Client is (almost) ready !

SPLAT (David Andrešič, in test version 30.10.2015)

Understands ssa_datatype   timeseries/{fits,votable , csv …)

Switches to crosses

Reverses Y axis on Magnitude, understand UCD (hacks)

Has errorbars (switchable, configurable)

Can save spectrum/LC in CSV, TXT ….

Nicer GUI (Margarida after lot of trials)

Can be modified to adopt standard (in principle)

Power of VO Technology

Small Hacks to other CLIENTS   (Client matters)

Aladin – since 8.169?   (thanks Pierre !)

- Shows coordinates of spectra

    - (multifiber spectroscopy – LAMOST)

    - Light Curves - Highlights objects for free

- Can send the link to individual LC/spectrum by SAMP

- Can display original Image (if hinted by UCD) directly

- Opens previews (so far spectra)

What must be done

TOPCAT
Understands the content of table
Advanced statistics
Advanced Plots
Custom procedures on data (activation function)
Highlights rows

Can Xmatch by multi SSA   -   check LC with catalogue value

DOES NOT allow the non-table received by SAMP

(Is every spectrum a VOTABLE ??? or FITS table ??)

SAMP sender should say its table

MODIFY DaCHS Web interface (previews, display of LC)

New General Protocol

Everything said is just a (1D) VECTOR
Datacubes → separate topics (SIAP v2?)

Simple Vector Data Access Protocol
Tables in databases – Big Data friendy

Modification of clients - „very tiny"
Everything is (almost) ready

DEMO of interoperability (Big Three)

http://vos2.asu.cas.cz/extract_jan15_v2/q/ssa/ssap.xml