Programme for the Post-processing and Analysis of Complex Large-Scale Spectroscopic Surveys Using the Virtual Observatory Protocols

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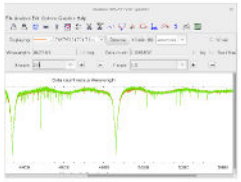
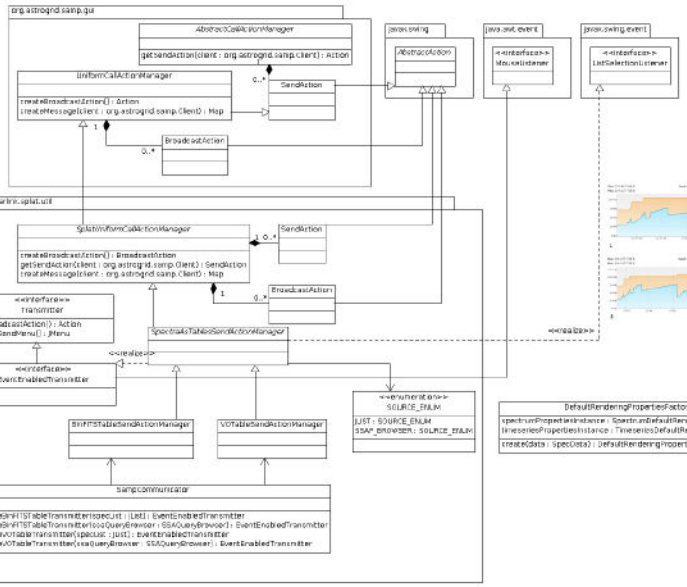
ASTROINFORMATICS

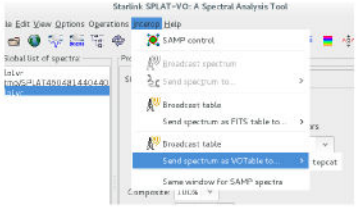
- Current astronomical instrumentation produces large data sets every observing night
- VIRTUAL OBSERVATORY: A collection of astronomical archives and software tools that utilizes the internet to allow international collaboration and scientific research
- SPECIALIZED PROTOCOLS: Images, spectra, messaging, cone search, general observation data

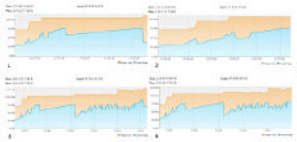
SPLAT - SPectraL Analysis Tool

- An application for displaying, modifying and analysing astronomical spectra
- Extended to include an interoperability with the Virtual Observatory
- International development team (Czech Academy of Science, Heidelberg University, VŠB-TUO)









SPLAT-VO IMPROVEMENTS

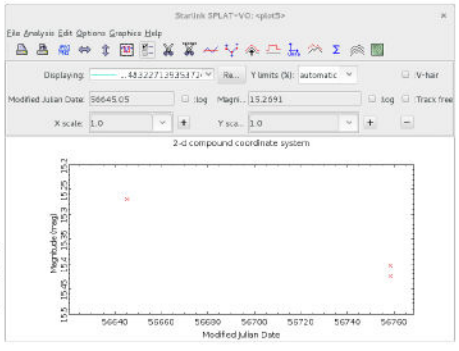
- More effective work with XML-based messaging protocol (SAMP)
  - Sending original spectra that has not been processed by SPLAT-VO
  - Virtual Observatory VOTable and general FITS format
  - Available from multiple places in SPLAT-VO
- Access to all FITS extensions
  - Loading all Header Data Units (HDUs) located in the input FITS file
  - Keeps FITS headers
- Time series support
  - Supports the need for time series standard
  - Crucial for handling data from several large scientific projects (including LSST or LIGO)
  - Time series data in VOTable format in a form of data cube
  - Parameters are subject of development and standardization
  - Identifies time axis (e.g. Modified Julian date) and observable axis (magnitude)
  - Adjusts rendering accordingly
- Spectra protocol query results enhancements
  - Copy current cell, selection or all data to clipboard
- Spectra protocol query results enhancements
- Spectral data export
  - To CSV and to a simple text file (columns are delimited by tabulator
- More efficient spectra deletion by means of visual selection
  - Select e.g. a noisy spectrum and conveniently remove it from working space

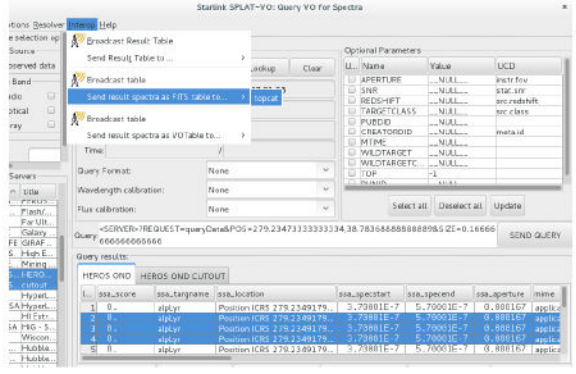
IMPROVEMENTS BEING PREPARED FOR SPLAT-VO

- Working Space (to be scheduled for Implementation)
  - Simply put: this feature will save all spectra loaded in SPLAT-VO at the moment to a user-defined folder
  - Automatic load of the Working space content: the user will be able to restore the previous work in SPLAT-VO just by starting it
  - The user will be able to immediately work with all loaded spectra in other tools (the Working space directory will accessible)
- Spectra Groups (to be scheduled for implementation)
  - Organization of incoming spectra to groups
  - It can significantly reduce memory consumption
  - Represented by VOTable stored in Working space
  - Source of spectra loaded to the current global list of spectra
  - Spectrum added to Global list of spectra will be added to the currently selected group (it can be later regrouped to n groups)
- Spectra Lazy Loading (to be scheduled for implementation)
  - Spectral data consumes a considerable amount of memory and should be loaded "lazily"
  - Only spectra of one spectra group or only actually plotted spectra will be "fully loaded",otherwise only metadata would be loaded

SPLAT-VO DEVELOPMENT PROCESS IMPROVEMENTS

- Wiki Documentation
  - At Stellar Department of the Astronomical Institute of Czech Academy of Science (AI CAS)
  - A central project documentation
- Issue Tracking
  - Current development process relies on e-mail communication
  - Unified with a new official issue tracker (GitHub Issues)
- Automatized build with Jenkins CI inside Docker
  - Continuous Integration (CI)
  - To ensure that the source code in repository is buildable at any time
  - Deployed in a Docker container on server of Stellar Dept. AI CAS
  - The container runs from custom Docker image derived from standard Jenkins CI Docker image
- Suggestions for further refactoring
  - Misspelled logic and listeners, Copy/pastes, Native libraries, Throw/catch as conditions, Deprecation





RESULTS

- Implementation of time series and data cubes support, which is current pressing issue in astroinformatics
- SPLAT-VO is also ready for more exotic forms of FITS data format
- Enhanced collaboration via SAMP messaging protocol
- CSV and plain text data exports (friendly with Big Data)
- Enhancement of collaboration with other tools and UX
- Scientific research is now therefore more painless
- Further enhancements: high improvement of work with large data sets and user experience
- Enhancement of development process and documentation

RESULTS PUBLICATION

- Nostradamus 2015 (Paris, France)
- IVOA Interoperability Meeting 2015 (Sydney, Australia)
- IVOA Interoperability Meeting 2016 (Cape Town, South Africa)
- SIMS2016 (Riga, Latvia)

VŠB-TU OSTRAVA 1991 FAKULTA ELEKTROTECHNIKY A INFORMATIKY

http://katedrainformatiky.cz/