Retrieving and Visualising Spectra Using SPLAT-VO

Author: M. Castro Neves

In this tutorial you will learn to use SPLAT-VO to search for spectra in the VO, load and visualise them. You'll also learn to use some of the many SPLAT-VO features to get more out of your spectra.

1   SPLAT installation

- SPLAT has to be installed on the system. Start the installer with:
    - *java -jar splat-vo.jar*

- After installation, start can be started (from the directory where splat has been installed) with
    - *bin/splat/splat*

2   Load a spectrum from file

The example file used can fe found on the CD (SPLAT_OBS.txt) or can be downloaded from *http://docs.g-vo.org/splat-obs.txt*.

- start SPLAT

- click on the load button

- set the type to Text file (.txt)

- load the example file. It will be automatically displayed in a new window.

The file you loaded contains a normalised spectrum of the star Feige 110, which is a hot subdwarf of spectral type OB.

3   Searching spectra with the VO

- Click on the SSAP button to open the VO browser window.

- On the left part to the VO browser window, you see a server selection frame. It contains a list of SSAP services and some checkboxes. There you can see the available SSAP services and what type of information they have. Try clicking on the icons of a few servers to see their metadata.

- When SPLAT starts, a locally stored server list is loaded. You can update it to load the newest list from the registry. Your local list will be then updated, so you don't need to perform this step very often:
    - Click on **Query Registry** on the lower left side of the browser window. A new window will open.
    - Choose the registry *http://registry.euro-vo.org/services/RegistrySearch* and click **OK**. It needs a moment until the list is updated.

Now you have an up-to-date server list and can search for and download a spectrum using SSAP. The server selection checkboxes let you select a subset of servers from the list based on data source and waveband information.

- In this tutorial we are looking for spectra on the optical and ultra-violet wavebands, so check **All** as source, and **Optical** and **UV** wavebands. Unmark the other wavebands. Notice that only some servers are now highlighted.

- On the *search parameters* frame, add *Feige 110* as **Object**. Click on **Lookup**, and the coordinates of the star Feige 110 will appear. Click the **SEND QUERY** button.

- In the *Query results* frame you will get a card box with answers from some servers. This may take some time. By clicking on a server name you see the list of spectra it returned.

- If you click on a spectra it'll be downloaded and displayed. Retrieve one spectrum from each of the following servers: **HST spectra** and **HST STIS spectra**. This can be done by selecting the spectrum and clicking on **Display Selected** (or double-clicking the chosen spectrum) and it will be downloaded and displayed in a new window.

4   Managing and visualising the spectra

Now bring the main SPLAT-VO window to the front. You see on the left side (*Global list of spectra*) the names of the spectra you've downloaded. Most have the same name, it may be confusing so it's useful to rename them.

- Click on one spectra from the list. Edit the **Short name** field. Write the name you want and press enter.

- repeat the procedure for the other spectra.

Now take a look on the spectra you downloaded. Do they have the same units? The same ranges on both axis? Perhaps some of them contain a wider wavelength range, so you may want to cut out a part of it. What about normalising them?

5   Select and cut-out a region

- Choose the spectrum you want to cut out

- On its display window, click the button to cut out selected regions

- A new window will open. Click **Add**.

- Mark the area of the plot you want to select. When finished, the selected range will appear in the cut window. You may edit the lower and upper bound by hand as well.

- Click then on **cut selected**. A new item will appear in the *Global list of spectra* at the main SPLAT window. Click on it and your selection will be displayed. Rename it if you want.

6   Normalisation

This is not (yet!) an automatic procedure in Splat but can be done manually.

- Choose one spectrum you downloaded and displayed.

- On its spectrum display window, click the button to generate a spectrum from interpolated line.

- A new window will open. The following options should be checked: Subtract line from spectrum *as a base line* and *Divide spectrum by line*. On the **curve type** menu either *hermite* or *akima* should be selected.

- Click then on **draw curve**, and draw some points on the spectrum in order to make a smooth curve. When ready, click **generate**. You will see that on the main splat window some new items will appear at the global list of spectra, and a new window will be displayed.

- If you are not satisfied with the result, you can click **reset** in the interpolation window and try again .

- Three new items will appear in the *global list of spectra*: Interpolated Line, Diff, and Ratio. The normalised curve is the one with the name starting with *Ratio:*. You can rename it to something nicer. Click on it and you will see the normalised spectrum.

- Normalise the other spectra you downloaded (or the cut outs).

7   Displaying more than one spectra in a window

Having normalised the spectra, now you will plot them together in one display window.

- From the main window, select the spectra you want to compare, i.e., normalised spectra and the one loaded from a file.

- Click on the multi-display button.

- You can change the colours of each single spectra to improve visualisation. This can be done either manually for each spectra or automatically (on the main splat window, menu **Options ->re-auto-colour all**).

Another way to visualise two or more spectra is to drag spectra from the *Global List of Spectra* and drop them into the display area of another plot.

8   More things to try/Homework

These were only a few features from SPLAT. You can now take a look on the manual by clicking the *help* button and see what else you can do with SPLAT-VO!