Aladin advanced

NOTE: This tutorial is based on Aladin v10. The content here described should be compatible with Aladin v11.

NOTE: Before running each of the following examples, it is convenient to remove all loaded catalogs and images by clicking the right mouse button over any of the planes in the panel to the right in the main window and selecting **Delete all panels**.

- **CDS-X match:** This option is suitable when we want to cross-match a catalog of sources with another VO catalog in different sky regions or when the region to load is too large, for example.

    - We will repeat the exercise described in the *Discovery* section of the science case using this time the CDS-X match option.

        - Load 2MASS-PSC sources around RA:08h 30m DEC:01d 30m with a 14 arcmin radius as described above. For clarity, the steps are repeated here:

            ◦ On top of the central panel, click "2MASS" just below the **Command** box. This will load all the sky observed by 2MASS.

            ◦ On the left panel of the Aladin window, click on the **select** box located in the bottom corner and type "2MASS". The discovery tree will open and show the available catalogs.

            ◦ Click in the "2MASS All-Sky Catalog of Point Sources" photometric catalog. A new window will pop up.

            ◦ Write 08:30:00 +01:30:00 14' in the empty box next to the **Load** button and click on **Load**. Aladin will load in the main window the 2MASS plane with 683 sources (you can see the number of sources by placing the cursor on the name of the plane in the right panel).

        - Cross-match the 2MASS catalog loaded in the previous step with SDSS-DR12 in an alternative way:

            ◦ On the left panel of the Aladin window, click on the **select** box located in the bottom corner and type "SDSS DR12". The discovery tree will open and show the available catalogs.

            ◦ Select the SDSS-DR12 catalog in the *V – Combined data* folder. A new window will pop up.

- Select **by CDS-X match** and click **Load**. A new plane will be loaded in the main window with 679 sources resulting from the cross-match between 2MASS and SDSS-DR12. Note: In the pop up window, the previous to the last symbol on the bottom right corner of the SDSS-DR12 window opens a new window where the configuration parameters of the cross-match can be changed.

- **MOC** (Multi-object coverage). Used to describe sky regions (e.g. footprints) and provides a very fast mechanism to perform operations (union, intersection,...) between them.

  - How to obtain the sky coverage of SDSS DR12:

    - On the left panel of the Aladin window, click on the **select** box located in the bottom corner and type "SDSS DR12". The discovery tree will open and show the available catalogs.

    - Select the SDSS-DR12 catalog in the *V – Combined data* folder. A new window will pop up.

    - Select **coverage**, deselect **in view** and then click on **Load**. The footprint of the SDSS-DR12 catalog will be loaded in the main window.

    - Click on the "CDS/V/147/sdss12 MOC" panel. On top will appear the sky coverage: 14520 sq. deg., 35.198% of the sky.

  - How to obtain the region of the sky in common between SDSS DR12 and UKIDSS Large Area Survey9 (LAS9):

    - Repeat the same steps described to obtain the SDSS-DR12 MOC.

    - Repeat the same steps to obtain the UKIDSS LAS9 MOC.

    - *Coverage → Logical operations*. A new window will pop up.

    - Select the CDS/V/147/sdss12 MOC and the CDS/II/319/las9 MOC and choose **Intersection**. Click on **Create**. A new plane with the coverage of the intersection of both MOCs will be loaded in the main window with a sky coverage of 3654 sq. deg and 8.585% of the sky.

- **Mosaic builder** using images with Aladin.

  - *File → Open server selector*. A new window will pop up.

  - On the left hand side, select *DSS* label and choose *DSS from ESO*.

  - Write 09 55 55.63423 +69 01 55.9684 in the **Target (ICRS, name)** box and select *DSS2-red – POSS2UKSTU_Red* in the drop down of **Sky Survey**. Change **Width** and **Height** to 5 arcmin. Click on **Submit**. The corresponding image will be loaded in the main window.

- Repeat the previous step with the following coordinates and the same width and height:
  - 09 55 32.07698 +69 04 51.2255
  - 09 55 08.96959 +69 02 57.2765
  - 09 54 49.20075 +69 07 25.5246

- *Image → Mosaic image builder*. A new window will pop up.

- Select each of the loaded images and click on **Create**. A new plane with the built mosaic will be loaded in the main window.

- ■ **Arithmetic operations** between images.

  - *File → Open server selector*. A new window will pop up.

  - On the left hand side, select *DSS label* and choose *DSS from ESO*.
  - Write LDS 1201 in the **Target (ICRS, name)** box and select *DSS2-red – POSS2UKSTU_Red* in the drop down of **Sky Survey.** Click on **Submit.** The corresponding image will be loaded in the main window.

  - In the same Server selector window, select *DSS1 – POSS1_Red and UKSTU_Blue* and click on **Submit**. The corresponding image will be loaded in the main window.

  - *Image → Arithmetic operation.* A new window will pop up.

  - Select the previous loaded images and chose **Subtraction**. Then click on **Create**. A new plane with the subtracted image will be loaded in the main window. In this case, a high proper motion binary system lies in the center of the image and the position of the components of the system at the epochs of the selected images can be clearly seen.

- ■ **RGB builder**. Compose an RGB image with Aladin.

  - Repeat the first four steps in the example above.

  - *Image → RGB image builder*. A new window will pop up.

  - Select the two previous loaded images and click on **Create**. A new image with the resulting composed image will be loaded in the main window. In this case, a high proper motion binary system lies in the center of the image and the position of the components of the binary at the epochs of the selected images can be clearly seen. NOTE: Although the **RGB image builder** is meant to build a three color composed image (red, green and blue), it is also able to build it with only two images, as noted in this example.

- ■ **Blink/movie** using images with Aladin.

    - ○ Repeat the first four steps in the example above.

    - ○ I*mage → Blink/movie generator*. A new window will pop up.

    - ○ Select the previous loaded images and click on **Create**. A new plane with the resulting movie will be loaded in the main window. On the top side of the central panel there are control buttons for the movie to stop, play, move forward/backward...

- ■ Display **instruments Field of Views**, useful to check whether one or another instrument's FoV covers the desired region.

    - ○ On top of the central panel, click "2MASS" just below the **Command** box. This will load the HIPS 2MASS survey.

    - ○ Write SDSS J082322.44+530705.5 in the **Command** box to center the view around that object.

    - ○ *File → Load instrument FoV.* A new window will pop up.

    - ○ Write SDSS J082322.44+530705.5 in the **Target (ICRS, name)** box and select *WFI.* Click on **Submit**. A new plane with the WFI FoV will be loaded in the main window. Try to change the **Angle** in the FoV window to change the rotation of the displayed FoV.

- ■ **Sextractor**: extract astrometry and photometry of a loaded image.

    - ○ *File → Open server selector*. A new window will pop up.

    - ○ On the left hand side, select *DSS* label and choose *DSS from ESO*.

    - ○ Write 00:10:15.02 -13:38:05.9 in the **Target (ICRS, name)** box and select *DSS2-red – POSS2UKSTU_Red* in the drop down of **Sky Survey**. Click on **Submit**. The corresponding image will be loaded in the main window.

    - ○ *File → Open server selector*. A new window will pop up.

    - ○ Select *Tools → S-extractor* on the top labels.

    - ○ Select the loaded image in **Image reference** and click on **Submit**. A new plane with the extracted catalog will be loaded in the main window.

■ Many other funcionalities are available, like:

- Astrometric calibration: *Image → Astrometrical calibration*
- Visualization of 2, 4, 9 or 16 panels (images) with the possibility of matching views (unifying sizes and orientation): *View → Panels*
- Load a macro script for repetitive tasks: *Tool → Macro controller*
- Generate a MOC from a loaded catalog: *Coverage → Generate a spatial MOC based on*
- Export images: *File → Export the current view (EPS)…*
- Export planes*: File → Export planes (FITS,VOTable…)*
- ...

NOTE: We refer the user to the F.A.Q section of Aladin for details on these and other functionalities.