HOWTO: Explore the Infrared Universe with the WSA

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Abstract

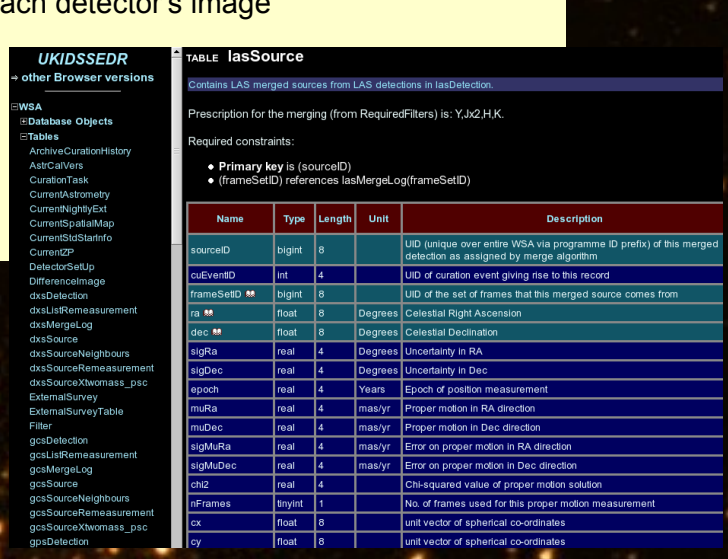
The WFCAM Science Archive (WSA) is an on-line database (http://surveys.roe.ac.uk/wsa) hosting all of the pipeline-processed infrared observations taken by UKIRT's new 0.2 deg^2 field camera, WFCAM. Primarily designed as a survey instrument, WFCAM is providing the Northern hemisphere coverage for the UK Infrared Deep Sky Surveys (UKIDSS), the Early Data Release for which is now available to all members of the ESO community. Here we demonstrate the use of SQL, a simple, yet powerful, database query language, to quickly and easily extract a useful sample of data from the vast archive. Important scientific examples, such as the search for brown dwarf stars and the exploration of the high-redshift universe are illustrated.

Step 1: Register: *http://www.ukidss.org/archive/archive.html*

Step 2: Log in to: *http://surveys.roe.ac.uk/wsa/*

Step 3: The Schema Browser

- Acquaint yourself with the contents of our database using the **Schema Browser**. It's arranged into ***Tables***, such as:
  - **lasSource** – Complete list of sources in the UKIDSS Large Area Survey (LAS)
  - **Multiframe** – Properties relating to an individual observation pointing
  - **MultiframeDetector –** Properties of each detector's image
- Each table has ***attributes*** such as:
  - **ra** – Right Ascension
  - **dec** – Declination
  - **sourceId** – a unique identifier for that source



Name	Type	Length	Unit	Description
sourceID	bigint	8		UID (unique over entire WSA via programme ID prefix) of this merged detection as assigned by merge algorithm
cuEventID	int	4		UID of curation event giving rise to this record
frameSetID	bigint	8		UID of the set of frames that this merged source comes from
ra	float	8	Degrees	Celestial Right Ascension
dec	float	8	Degrees	Celestial Declination
sigRa	real	4	Degrees	Uncertainty in RA
sigDec	real	4	Degrees	Uncertainty in Dec
epoch	real	4	Years	Epoch of position measurement
muRa	real	4	mas/yr	Proper motion in RA direction
muDec	real	4	mas/yr	Proper motion in Dec direction
sigMuRa	real	4	mas/yr	Error on proper motion in RA direction
sigMuDec	real	4	mas/yr	Error on proper motion in Dec direction
chi2	real	4		Chi-squared value of proper motion solution
nFrames	tinyint	1		No. of frames used for this proper motion measurement
cx	float	8		unit vector of spherical co-ordinates
cy	float	8		unit vector of spherical co-ordinates

Step 4: Teach yourself SQL

... using our **Cookbook**.

SQL seems daunting at first, but after an afternoon playing with SQL statements it becomes very intuitive and you'll see how incredibly useful it can be!

2.4.2 Selections

A selection is the retrieval of the data values in particular columns for those rows in a table which satisfy certain critieria. So, if one were interested only in fields whose nominal centres lie in a 1 degree strip on the celestial equator, the appropriate SQL query would be:

```
SELECT ra, dec
FROM lasMergeLog
WHERE dec BETWEEN -0.5 AND +0.5
```

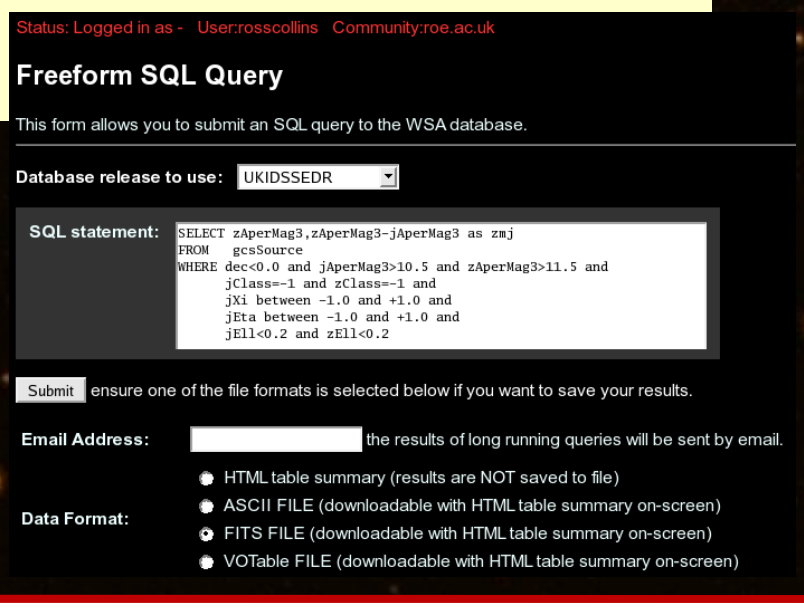
In this example the SQL statement has been split into three lines to emphasise the *SELECT…FROM…WHERE* syntax, but this is still one SQL statement. The SQL Query Form in the WSA interface ignores the whitespace at the end of each line of text and generates a single query string from valid multi-line text like this. (Note that this means that users should *not* used double hyphens to indicate comments in multi-line queries, since this will result in all text after the first comment being ignored.)

Step 5: Query the database

Put your new found skills to practice with a **Freeform *SQL*** query. Use the Schema Browser to find the correct names for the tables and attributes you wish to search.

Make sure you are logged in, and have selected the correct database e.g. UKIDSSEDR.

Choose your preferred data format to store the results, with the FITS or VOTable formats you can plot your results in TOPCAT (which you don't even need to install on your computer) or save to your MySpace on Astrogrid.



WSA Database - SQL Query Results

Data file generating queries can take a bit longer to execute as they write to a file ALL rows returned by the query.

A web link to your generated output file will appear at the bottom of this page.

Connecting to UKIDSSEDR database
QUERY STARTED: Fri Mar 24 10:26:51 GMT 2006 [1 active, 1539 total]

Please keep this browser window open and wait for your results to appear below...

timeout: 1800

Connected to database

•••••• OK

Submitted query: SELECT zAperMag3,zAperMag3-jAperMag3 as zmj FROM gcsSource WHERE dec<0.0 and jAperMag3>10.5 and zAperMag3>11.5 and jClass=-1 and zClass=-1 and jXi between -1.0 and +1.0 and jEta between -1.0 and +1.0 and jEll<0.2 and zEll<0.2

	zAperMag3	zmj
1	+17.883947	+0.657248
2	+17.694395	+1.013060
3	+17.760324	+0.425507

(Query returned 155318 result rows, only the first 30 rows are shown in the displayed table.)

Download Results File , your results in a gzipped FITS file (Contains **155318 rows**, 1 MB)
Launch file in Topcat (requires Java 1.4 and Java Web Start, approx 3Mb download for Topcat application)
Save file to MySpace (requires an AstroGrid account, Java 1.5 and Java Web Start to launch, uses AstroGrid workbench, large first download)

Step 6: Use your data