VODay 2012 in Potsdam – TAP/ADQL Tutorial: Exercises 2012-11-07

Florian Rothmaier (Astronomisches Recheninstitut Heidelberg)

General hint for all exercises:

- launch TOPCAT
- in the menu: click on VO → Table Access Protocol (TAP)
- use the registry `http://registry.astrogrid.org/astrogrid-registry/services/RegistryQueryv1_0` to search for the TAP service of the GAVO data centre in Heidelberg:
  - click on Submit Query
  - the subsequent click on GAVO DC TAP will fill the appropriate URL into the TAP URL text field
  - click on Enter Query
- select a table: this will display the table's metadata (column names, descriptions, ...)
- enter your query in the text field ADQL Text (if you feel unsure, you might get inspired by the Examples button)

Basic query syntax:

```
SELECT [TOP <setLimit>] <selectList>
  FROM <fromClause>
    [WHERE <conditions>]
    [GROUP BY <columns>]
    [ORDER BY <columns>]
```

Join tables:

```
SELECT [TOP <setLimit>] <selectList>
  FROM <table1>
    JOIN <table2>
      {ON <searchCondition> | USING (columnName)}
```

Specific hints for the following exercises:

- arithmetic operators: $+$, $-$, $*$, $/$
- comparison: $=$, $<$, $>$, $\leq$, $\geq$
- logical operators: `AND`, `OR`
- logarithms: `LOG(x)` (natural logarithm) , `LOG10(x)`
- column renaming: `AS`, e.g. `SELECT 1+1 AS two from mytable`

- count the number of items in a table: `COUNT(*)`, e.g.
  `SELECT count(*) AS numEntries FROM <tablename>`
- commercial rounding to the next integer: `ROUND(x)`
- arithmetic mean: `AVG(x)`
- geometrical queries:
  - function `CONTAINS`: accepts two geometry types, e.g. (`CIRCLE`, `POINT`) and returns 0 (*false*) or 1 (*true*)
  - function `CIRCLE`: expresses a circular region on the sky
    syntax: `CIRCLE(<coordSys>, ra, dec, radius)` with the coordinates and the radius in degrees, e.g. `CIRCLE('ICRS', 25.4, -30.0, 1.5)`
  - function `POINT`: expresses a single location on the sky
    syntax: `POINT(<coordSys>, ra, dec)`, e.g. `('ICRS', 174.2, 48.9, 1.5)`

Exercises:

1. **Apparent Magnitude**
   Select the common name and the apparent (visual) magnitude of the 20 brightest stars in the table `fk6.part1`.

2. **Absolute Magnitude**
   Select the absolute magnitude and the common name for the 20 stars with the greatest visual magnitude in the table `fk6.part1`.

   Hint: The absolute magnitude is given by $M = 5 + 5 \log p + m$ with the parallax p in arcsec and the apparent magnitude m (look at the Table Metadata to check the units!).

3. **Correction of a Corrupted Query**
   As before, select the absolute magnitude and the common name for the 20 stars with the greatest visual magnitude, but this time from the table `fk6.fk6join`. This will fail for reasons that should tell you something about the value of Bayesian statistics. Make the query work.

   Hint: Use the `WHERE` clause.

4. **Proper Motion (Element Grouping)**
   Get the averages for the total proper motion from `lspm.main` in bins of one magnitude in Jmag each. Let the output table contain the number of objects in each bin, too.

   Hint: Use the `GROUP BY` clause.

5. **Bibliographic Search (Join Tables #1)**
   While the table `ohmaser.masers` contains the astronomical data of OH (hydroxyl) maser sources, the table `ohmaser.bibrefs` stores the bibliographic information related to these sources. Find the column which is present in both tables and use it to join the tables (`JOIN`

... USING syntax) and to extract the columns measure_no, source_no and bibcode from them.

6. Geometries (Join Tables #2)

Compare the radial velocities given by the rave.main and arihip.main catalogues, together with the respective identifiers (hipno for arihip, name for rave). Use a positional cross-match with a couple of arcsecs. In a second step, make sure that you only select rows for which the radial velocity content in arihip.main is not empty.

Hint: Use the JOIN ... ON syntax and the CONTAINS function.