• Summary of miscellaneous enhancements
• New Visualisation windows
Miscellaneous Enhancements

- VOTable 1.3 (PR) compatible:
  - Reads BINARY2 and all other defined 1.0–1.3 VOTable formats
  - Writes your choice of VOTable version as per `votable.version` system property
    - E.g. `topcat -Dvotable.version=1.3`
    - Default output version is VOTable 1.2 (was 1.1)
    - — but note still no STC

- Improved ADQL parsing in TAP window (can now label multiple syntax errors per query)

- MOC for multi-cone search (see Apps/Reg Coverage session after coffee)

- New KCorrections functions in expression language (Igor & Ivan calculations)

- New IPAC output format (previously only IPAC on input)

- First public release for almost 2 years
  - ... lots of bug fixes

- New logo!
New Visualisation

Overview

- Existing (v3) plotting windows work fairly well, but are hard to enhance:
  - contours, footprints, vectors, (all-)sky coordinates, new plot types, multi-threading, external control, better axis labelling, ...

- Re-write from scratch

- Big job (∼40kLOC so far)

- Still some work to do:
  - user interface issues
  - missing features (histogram, stacked line plot, ...)
  - bugs

- Experimental release (v4.0b)
  - new plot windows don’t replace classic plot windows (yet) — use main Graphics menu
  - for enthusiasts, early adopters, special viz. needs
  - feedback very welcome

- New capabilities a bit harder to drive, but offer more possibilities
New Visualisation Features

- Sky coordinate plot
  - labelled grid lines, all-sky plots, easy projection selection
- Improved interactive response
  - drag plots around, zoom with mouse wheel, sliders cause instant replot
- Improved 3D navigation
  - zoom data inside cube, re-centre cube on right-click
- New plot colouring modes
  - combined scatter/density plot
- More data plot shape options
  - vectors, ellipses, sized markers, point-point links, ...
- Better axis labelling
  - select font type and size, full \LaTeX{} typesetting available
- Overlay different plot types on same axes
  - scatter plots, density maps, contours, more??
- Better capabilities for very large data sets
  - meaningful Mpoint viz options, better memory management, multithreading hooks
- Analytic function plotting
  - $x=f(y)$, $y=f(x)$ using expression language
- Extensibility
Example: Large data set

8 million point colour-magnitude diagram

- Hybrid scatter plot/density map shows dense regions while outliers still visible
- Option to overplot contours
- Sweep cut levels/contour boundaries interactively
Example: All sky plot

Multiple data sets on all-sky view

- Select data & view projections (equatorial, galactic etc) separately
- Scale plot point sizes by object radius
- Choose projection (Aitoff, sin, Plate Carrée)
Example: 3D Navigation

Simulation $x, y, z$ data

- Mouse wheel zooms in/out — cube wire frame stays fixed, but data volume decreases/increases around centre
- Right-click moves indicated point/region to cube wire frame centre
Example: Vector Drawing

Simulation $x, y + v_x, v_y$ data

- Use vector option and give velocity components
- Vector size by default automatically scaled to sensible size
- Can interactively rescale to taste with a slider
- Works in 3D as well
Future Plans/Possibilities

Capabilities opened up by new visualisation framework:

- Overlay coverage display on sky plots
- Overlay image postage stamps on scatter plots
- Overlay image or image-like data on plots
- Immediate visual representation of crossmatch results
- Grid of scatter plots (like R `splom`)
- Animations
- Interactive subset adjustment
- Interactive STILTS plots
- External control of plots
- Better capabilities/docs for embedding plots in 3rd party code
- Fitting
Feedback

Feedback wanted for new visualisation:

- User interface
  - Experiences — how easy/hard is it to learn and use?
  - Documentation — is it adequate?
  - Suggestions for improvements

- Capabilities
  - Are new features useful? Worth the additional effort to use?
  - Suggestions/Requirements for new plot types
  - Missing features

- Bugs . . .

More information:

Introduction:
http://www.starlink.ac.uk/topcat/v4_graphics.html

Full documentation:
http://www.starlink.ac.uk/topcat/sun253/plot2.html