Accessing Wide Imaging Surveys from AstroGrid

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Overview

- The Virtual Observatory: what & why
- The UK VO: AstroGrid
- Accessing large imaging surveys and databases
- Example: doing science with AstroGrid
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The Virtual Observatory (VO)

- Collection of integrated astronomical data archives and software tools that utilize computer networks to create an environment in which research can be conducted (http://www.encyclopedia.com)

Thanks to Ohishi Masatoshi (NAOJ) for the pointer...
VO Goals

• Improving the quality, ease, speed and cost effectiveness of on-line astronomy

• Making comparison and integration of data from diverse sources seamless and transparent

• Removing data analysis barriers to multiwavelength analysis

• Enabling access and manipulation of large data sets
International Collaboration

• Similar efforts now in 15 countries:
  – UK, USA, Canada, France, Germany, Italy, Holland, Japan, Australia, India, China, Russia, Hungary, South Korea, ESO, Spain

• Active collaboration among projects
  – Standards, common demos
  – International VO roadmap being developed
  – Regular telecons over 10 timezones

Formal collaboration
International Virtual Observatory Alliance (IVOA)
The need for a VO

- Data volume doubles every year
- Increase of size and multiplex capabilities of new instruments (WFCAM, VISTA, ...)
- By 2010 we will have **petabytes** of data
- Federation of the data is a must, but how?
- WWW becomes the best observatory:
  - Data on every part of the sky and every wavelength
  - The seeing is always great. Never cloudy.
  - As deep as the best instruments.
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AstroGrid: the UK VO

- Astrogrid release 1.1:
  - [http://www.astrogrid.org/release](http://www.astrogrid.org/release)
- Access to imaging servers (e.g. WFS, SDSS), catalogues (e.g., WFS, 2MASS, SWIRE, FIRST, Vizier)
- Wide range of tools available:
  - X-matcher, SExtractor, SWARP, HyperZ, BPZ, GALAXEV, ...
AstroGrid: the UK VO

Astrogrid Portal

Astrogrid Workbench
AstroGrid: MySpace

- Virtual disk space where you can store results, temporary files, and new things like query files and workflow files, so you can adjust and re-run jobs on a later day.

- Visible from any computer.
Astrogrid: Workflow

- User compose a complex series of tasks which can be run on sequence or parallel (or loops)
- Jobs are run remotely and asynchronously
- Results are stored in a virtual file system
- Queries and workflows can be re-used and shared
- AstroGrid is currently the only VO project with a workflow workbench where scientific workflows can be created and run.
- Workflows are constructed via discovery of relevant data and applications from the registry
Finding Information: the Registry

- How do you find the data you require?
- How do you decide which resource (data, application, information, disk, ...) to use?
- The registries are the yellow pages for astronomical resources
- All VO registries harvesting each other: thus querying any one returns full list of globally held resources.
- AstroGrid access all astronomical resources
Finding Information: AstroScope

- General
- Astrographic
  - ROSAT All Sky
  - ROSAT PSPC
- Catalogs
  - Hipparcos
- Search Results
  - HST Archived
  - IRAS Point
- Images
  - NRAO VLA Sky
  - IRAS Sky Survey
  - SkyView
  - SFD IR and
Finding Information: Astroscope
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Simple Image Access Protocol (SIAP): accessing images from Wide Field Surveys

- SIAP is a protocol for retrieving image data from a variety of astronomical image repositories through a uniform interface.
- The service returns a list of candidate images.
- For each candidate image an access reference URL may be used to retrieve the image.
Simple Image Access Protocol (SIAP): accessing SDSS images ...
Simple Image Access Protocol (SIAP): ... and WFCAM images ...
Simple Image Access Protocol (SIAP): ... and WFS images
Simple Image Access Protocol (SIAP): multiple searches
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Defining a workflow

Position selection
RA, DEC

Optical Imaging SIAP Search (WFS)

Object Extraction (SExtractor)

User Defined Data: own near-IR images

Object Extraction (SExtractor)

SWIRE Catalogue Query

Cross Match

Photometric Redshifts Estimation (BPZ)
Extracting Objects

for loop
(different filters and Chips)

SExtractor in action
Photometric Redshifts

BPZ step
Job submission

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<thead>
<tr>
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Workflow Submitted: Job ID is jas.galahad.star.le.ac.uk/143.210.36.238/eduardogonzales@gmail.com/3150
Looking at the candidates

- The redshift distribution shows very few objects at $z \sim 5-6$.
- Unsurprisingly most of those are **point-like** in the images and are best fitted by a **QSO template** SED.
- Using TOPCAT the selection in the graph highlights the row in the table and displays image.

http://www.starlink.ac.uk/topcat
Looking at the candidates

The selection of one point in the previous magnitude vs photoz diagram triggers a selection of the correspondent row in the table.

But also triggers a custom action... in this case a URL showing the postage stamps...
### WFS + IR

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<th>r</th>
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### IRAC

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Summary

• The VO and tools developed as part of it are opening a new analysis methodology in the era of “data expansion”.
• AstroGrid is an active member of the VO and already delivers a functional system capable of accessing and analysing a wide range of survey data.
• Anybody is welcome to try the system and submit their feedback (http://www.astrogrid.org)