Astronomical Visualization for Education

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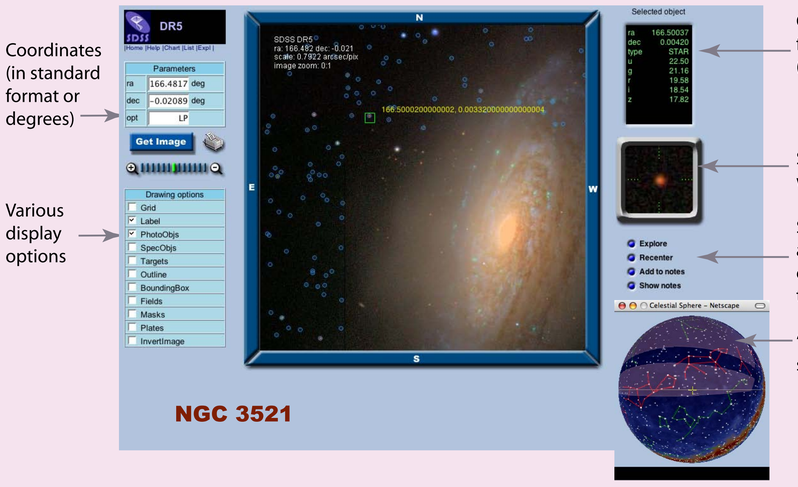
A plethora of diverse resources for astronomical research awaits scientists at their fingertips. Over the last 10 years, many efforts have focussed on enhancing education and engage the public in science using such astronomical data.

Most of the materials created are centered on small data sets culled by scientists and developers. With the emergence of large data sets such as those available through the NVO, the SDSS, the DSS, WMAP, GOODS, and others as well as the promise of observatories such as the LSST, development of education activities utilizing such vast data stores has exciting potential.

This **kind of education has never been done before** offering Astronomy an opportunity to be a pathfinder for other sciences. In this poster, **we remark upon visualization of large data sets** and and best practices for integrating them into educational experiences.

The SLOAN Digital Sky Survey (SDSS) SkyServer Navigate Tool

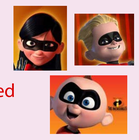
This tool was developed specifically for browsing the SDSS, but could be expanded to accommodate other data sets.



Notes:
Educational exercises available on SDSS site
http://cas.sdss.org/dr5/en/

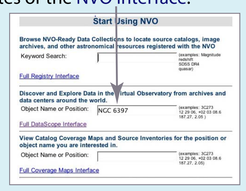
The Good: - viewport intuitive to use
- Skymap a help for all sky orientation
- coordinates and other info easily viewed
- contextual help available on mouse-over

Caveats: - Training required for interface educational use
- display options peculiar to SDSS
- addition of Digitized Sky Survey data would be useful
- access to background info and educational projects recommended

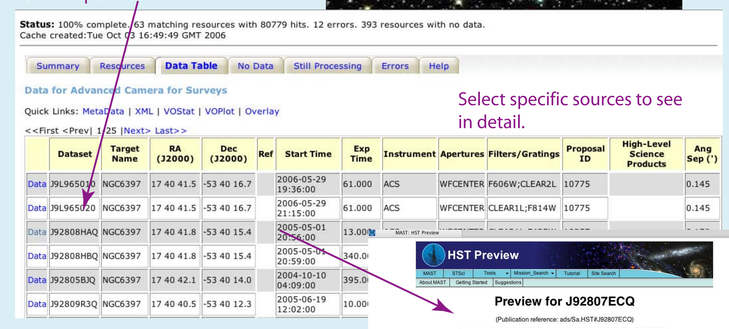


National Virtual Observatory and Aladin

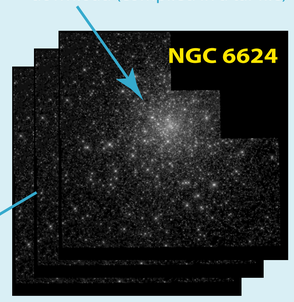
Search for data through individual sites or the NVO interface.



Review all the sources of data available from the NVO Datascope interface.



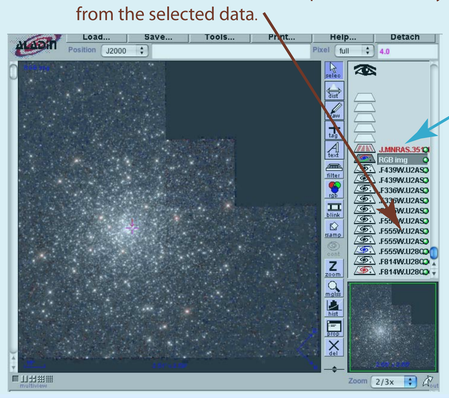
Collect selected data files for download (compiled in a tar file)



The Good: - many types of data
- most major observatories
- catalog data available
- FITS files can be retrieved for educational purposes (from some observatories)

Caveats: - interface not for novices
- difficult to understand data quality
- most archives do not provide fully processed data (e.g. FITS)
- significant training needed

Aladin Tool: Create color composites on the fly from the selected data.

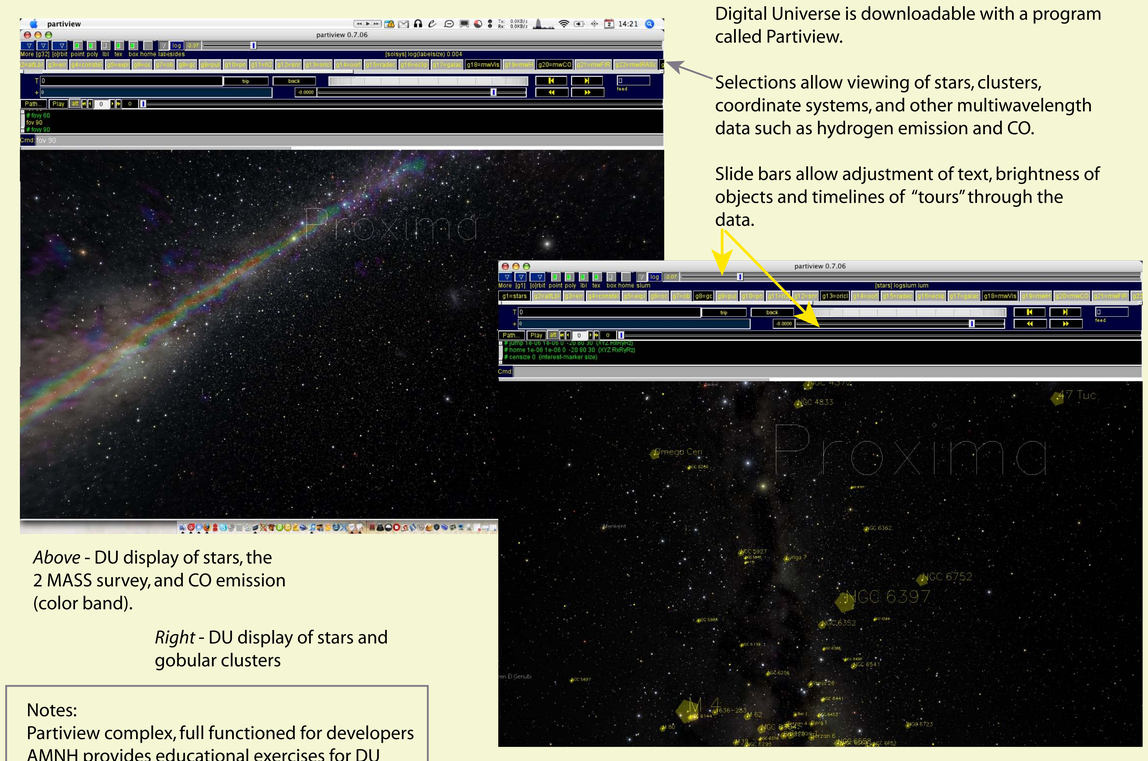


The Digital Universe from the American Museum of Natural History

Digital Universe is downloadable with a program called Partiview.

Selections allow viewing of stars, clusters, coordinate systems, and other multiwavelength data such as hydrogen emission and CO.

Slide bars allow adjustment of text, brightness of objects and timelines of "tours" through the data.



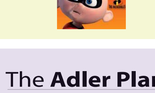
Above - DU display of stars, the 2 MASS survey, and CO emission (color band).

Right - DU display of stars and gobular clusters

Notes:
Partiview complex, full functioned for developers
AMNH provides educational exercises for DU
Appropriate for planetarium show developers too

The Good: - good all sky visualization
- many datasets available
- programmable tours possible
- other functions also possible
- slidebars useful but take practice

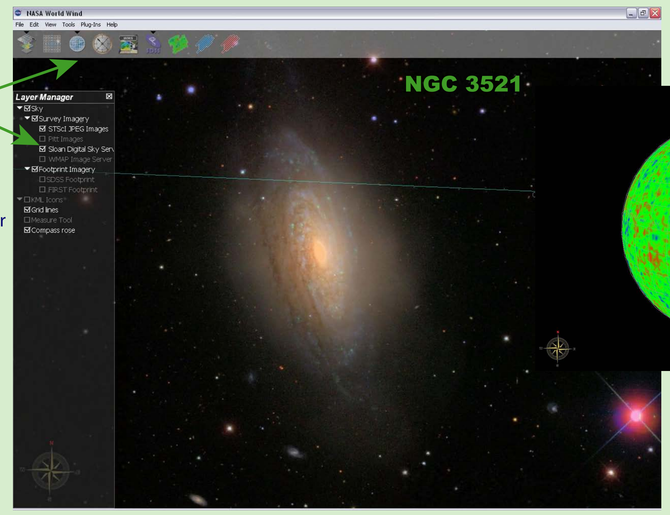
Caveats: - non-intuitive functionality
- use of DU manual manditory
- Partiview very complex
- No contextual help available online
- Novice use not recommended



NASA World Wind

World Wind is an application created for visualization of Earth Data and producing Fly-throughs of data sets.

Selection boxes to display data or footprint services. Also can be activated in menu.



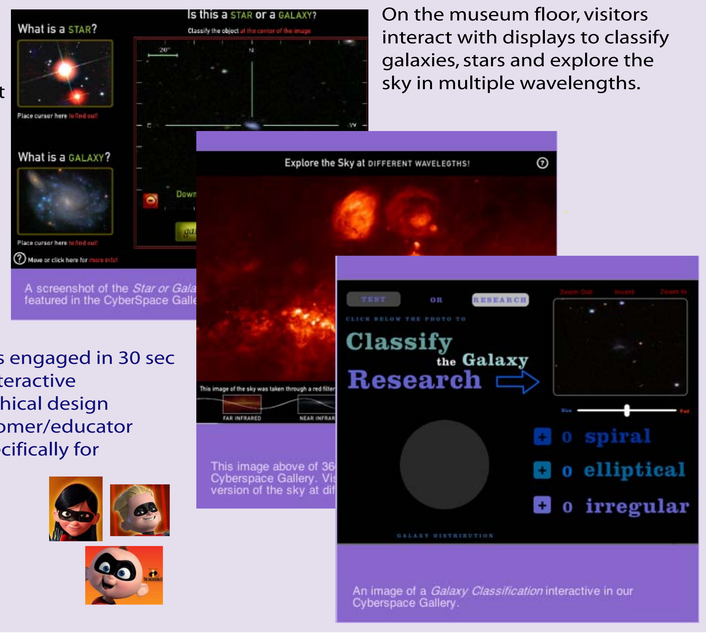
Full globe datasets can be displayed with / without grid lines

The Good: - tested with Earth data
- some full globe data interesting for researchers (but of marginal educational value)
- includes SDSS data, will include DSS data soon
- should support KML files (Google)

Caveats - difficult to find specific objects
- no coordinate entry
- not for novices

The Adler Planetarium CyberSpace

Tools used are:
- SDSS image Cutout
- VO Table
- OpenSkyQuery
- Montage
- SkyView



On the museum floor, visitors interact with displays to classify galaxies, stars and explore the sky in multiple wavelengths.

The Good: - visitors engaged in 30 sec
- interesting and interactive
- simple, clean graphical design
- created by astronomer/educator (M. SubbaRao) specifically for informal science

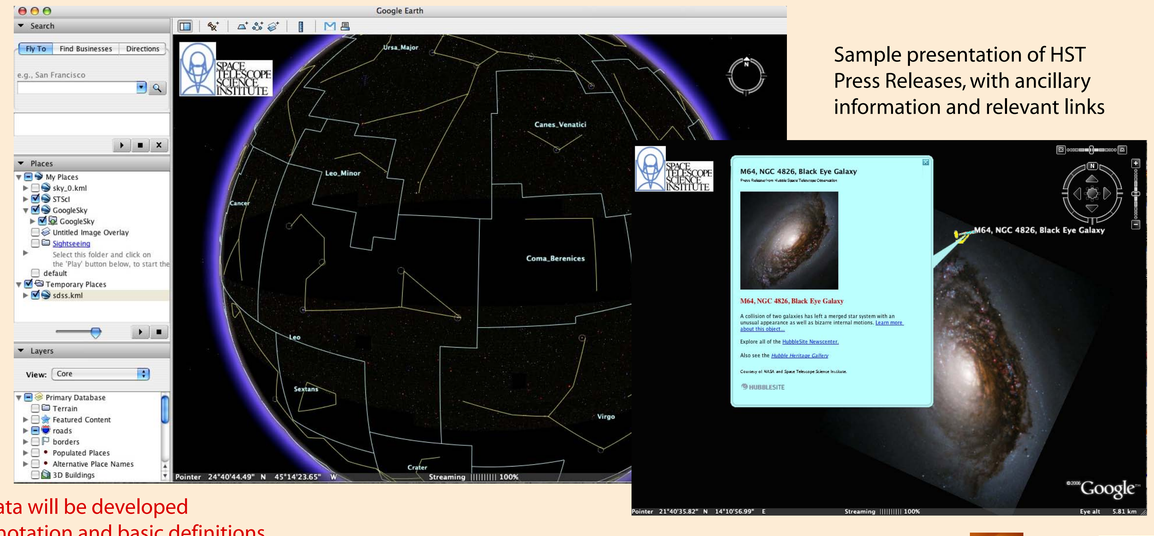
Caveats:
- not online yet

Google Interface

Protocol defined for Google Earth

Experiments with SDSS data and DSS data for base map

Ingestion of catalog data for overlay on basemap



Sample presentation of HST Press Releases, with ancillary information and relevant links

The Good: - interface simple, in use by thousands of users
- intuitive display function
- growth of community has great potential
- students, general public and researchers can contribute

Caveats: - use of protocol will require some training
- simple forms for submitting data will be developed
- astronomical data requires annotation and basic definitions