Demonstrations

[D1]˚Starlink Software Developments

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We shall demonstrate some of the new features in the Spring 2002 release of the Starlink Software. We shall also present our recent work on Web Services and demonstrate some new Java tools for astronomical data processing.

[D10]˚N-body Testbed for Undergraduate Education Utilizing a Web Interface to NEMO and MD-GRAPE-2

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An N-body simulation testbed called **NBodyLab** was developed at Pomona College as a teaching tool for undergraduates. The testbed provides a web interface to selected back-end NEMO modeling and analysis tools and several integration methods which can optionally use an MD-GRAPE-2 PCI card on the server to accelerate calculation of particle-particle forces. The testbed provides a framework for using and experimenting with the main components of N-body simulation: data models and transformations, numeric integration, analysis and visualization products, and acceleration techniques (in this case, special purpose hardware). The testbed can be used by students with no knowledge of programming or Unix, freeing such students and their instructor to spend more time on scientific discovery. The advanced student can extend the testbed software and/or more quickly transition to the use of more advanced Unix-based toolsets such as NEMO, Starlab and model builders such as GalactICS. Cosmology students at Pomona College used the testbed to study collisions of galaxies with different speeds, masses, densities, collision angles, angular momentum, etc., attempting to simulate, for example, the Tadpole Galaxy and the Antenna Galaxies. The testbed framework is available as open-source to assist other researchers and educators. Experiences with visualizers running under Windows are discussed and recommendations made for testbed enhancements.

[D2]˚Virtual Observatory Initiatives at the ESO/ST-ECF Archive

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The ESO/ST-ECF archive, hosting data from HST, the VLT and many La Silla instruments has always been at the forefront of new initiatives in the area of archives. Recently, new technologies such as magnetic disk based archive systems (NGAS) have been developed and put in operations. The approved European initiative on a phase A study of an Astrophysical Virtual Observatory (AVO) has originated at and is

coordinated by our site. This demo aims at presenting some of the newest technologies and concepts we are developing/using for the AVO in the areas of:

¥ infrastructure:
- the NGAS system
- our archive request handling system
- the new OTFR system for HST data
- previews of imaging data and spectra

¥ interoperability and GUI:
- Querator: an advanced archive query tool, a result of the first ASTROVIRTEL cycles
- Web Services
- an improved type of WFPC2 associations, to provide deeper products to our archive researchers
- a new tool for visualizing associations of spectra.

Furthermore we would like to discuss with you requirements, concepts, design, tools, software, databases, data-mining, and any other matter related with Virtual Observatories strategies in general.

[D3]˚The Cosmo.Lab Project: Developing AstroMD, an Object Oriented, Open Source Visualization and Pre-analysis Tool for Astrophysical Data

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The Cosmo.Lab project, financed by the European Community, has the object of developing AstroMD, a tool of visualization and analysis of astrophysical data. AstroMD responds to the requirements proposed by several research fields: data coming from cosmological simulations, from observational catalogues and extended objects like radio sources or clusters of galaxies. Its basics functionalities deals with the visualization of point-like distributions (stars, galaxies, n-body particles...) and their properties (spectral type, luminosity, temperature...), the visualization of continuous fields (gas density, gravitational potential...), the 3D navigation inside the data, the calculation of statistical properties of user-selected samples (correlation functions, power spectra, Minkowski Functional,...), the modeling of 3D shapes from 2D observed images (galaxies, radio lobes...). Specific tools, like Tipsy and Fits readers have been specifically implemented. As far as the design and implementation of AstroMD has been strongly influenced by object-oriented principles, it has been developed using C++ (for the numerical core) and IncrTcl (for the GUI) as programming languages and the Visualization Toolkit (VTK) as graphical library. VTK, by Kitware, is a freely available software portable on several platforms. AstroMD exploits the most advanced visualization technology, based on virtual reality, in order to build a leading edge instrument for scientific research. However it is a scalable software which can be used also on PCs or workstations. It is open-source and freely downloadable from the web site (http://cosmolab.cineca.it). In this demo we will present the basic feature of AstroMD both from the visualization and from the analysis points of view. Furthermore we will show how AstroMD can be used for educational proposes with the possibility of creating interactive lectures.

[D4]˚IRAF Software Developments

Michael Fitzpatrick and the NOAO Science Data Systems Group, NOAO

Members of the NOAO Science Data Systems (nee IRAF) Group will be on hand to demonstrate recent software developments in IRAF, X11IRAF, archiving, and to discuss other work currently in progress. New or on-going developments include major new releases of both IRAF and X11IRAF (including new platform support for Mac OS X), application enhancements for improved pixel mask support, new tasks for object detection and removal, network catalog queries, cosmic-ray removal, multi-amp CCD reductions, and an improved help and installation system. Demos of the new NOAO Science Archive, new XImtool functionality, and other new IRAF applications will also be available.

[D5]˚New STScI Data Analysis Applications

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PyDrizzle

The dither package within STSDAS provides all the basic tools to detect cosmic rays in sets of overlapping images, refine the registration between images, then combine them while removing the cosmic-rays and geometric distortion. However, using these tools can be a complex and frustrating experience. The Python task PyDrizzle provides the basis for automating all of these steps for HST images. PyDrizzle relies on PyRAF to interface with the IRAF tasks in the dither package (primarily drizzle), PyFITS to work with the FITS input and output images, and numarray to perform computations of parameters.

PyDrizzle makes it easy for a user to work with dithered or single images using either a simple IRAF task interface to run the task in one step or the Python syntax to provide investigative tools during processing. We will illustrate some of the most recent added capabilities; namely, drizzling input images to separate outputs, blotting images back, use of separate WCS information to specify the output product and support of independent computation of shifts to correct those computed from the headers to properly register images.

Specview

Specview is a spectral visualization tool designed to provide easy simultaneous display and analysis of multiple 1-D spectrograms of the same astronomical source taken with different instruments. It fully supports all spectral formats generated by HST instruments, as well as IUE NEWSIPS files and a generic text-based format. It is a standalone application written in Java that can as well be bundled with other Java software (currently it is bundled with the Star View archive data browser and analysis tool). Aside its main visualization mode, it also features a powerful spectral model fitting engine. The software can be downloaded from http://specview.stsci.edu.

[D6]˚New STScI Data Analysis System Software

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PyRAF

PyRAF is a new command-line facility for IRAF based on Python that is now officially released (v1.0). It allows running almost all IRAF executables and CL scripts. IRAF tasks can be run interactively using IRAF CL syntax or Python syntax with full image display and graphics capabilities. STSDAS v3.0 requires PyRAF for some of its new tasks.

PyFITS

This Python module enables reading and writing of FITS image and table data to and from Python arrays, and allows interactive access to header information via the Python interpreter. PyFITS has improved capabilities including a new I/O model, ability to handle scaled and boolean columns in tables, ascii tables, verification of output files, more convenience methods, better use of memory, and faster I/O.

numarray

Numarray is a Python module that provides IDL-like capabilities for efficient mathematical operations on large numeric arrays. It has been updated significantly and provides nearly all the functionality that is present in the module it replaces (Numeric). Support for new types has been added (complex, 64-bit ints); arrays can be pickled (i.e., saved to disk portably); and a C API has been added, including a compatibility layer that makes it much easier to adapt libraries written for Numeric (illustrated by the addition of the standard Numeric libraries FFT, RandomArray, and LinearAlgebra).

[D7]˚ National Virtual Observatory Efforts at SAO

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The National Virtual Observatory (NVO) project is an effort to federate astronomical resources, to provide seamless access to heterogeneous data at various centers throughout the world, and make them appear to the user as a homogeneous set. The NVO will reduce the user s need to obtain, recall and manage details such as passwords, band coverage, instrument specificity and access methodologies for each archive site in order to get and analyze data. The project will employ Grid technology and distributed computing techniques to manage enormous data volumes and processing needs.

At the Harvard-Smithsonian Center for Astrophysics (SAO), we are developing a small scale prototype implementation of the NVO paradigm. This demonstration will illustrate the directions being pursued toward this goal by allowing a user to request data from various resources, display the returned data, and interactively perform anal-

ysis on that data.

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[D8]˚ClassX: A Real Time X-ray Classifier

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We demonstrate use of the ClassX X-ray classifier in interactively classifying lists of objects requested by the user. ClassX extracts information for the list from diverse sources on the Web and uses this information as input to a network of trained classifiers.

Early classifiers use only luminosity and position information. These classifiers are good at distinguishing basic categories of objects, but as we include additional kinds of data (source extent, variability and more detailed spectral information) we anticipate greater power in distinguishing source classes.

ClassX is a two year project supported by NASAs AISR program.

[D9]˚A Consolidated Distribution System for STScI-developed Software

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STScI currently distributes three software products written in Java. STGMS is distributed as both an applet and an application, while APT and Starview are distributed as applications.

We describe the implementation of a new distribution strategy for all three products using a COTS solution. We will demonstrate the new download and update system. We focus on the STGMS implementation, which requires moving most STGMS users from the applet to the new application.