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Access to Data Sources and the ESO SkyCat Tool

M. A. Albrecht, A. Brighton, T. Herlin, P. Biereichel

European Southern Observatory

D. Durand

Canadian Astronomy Data Center, DAO/NRC

Abstract. SkyCat is a tool that combines image visualization with access to astronomical catalogs and data archives. SkyCat uses a standardized URL syntax to access a large number of data sources on the net. This paper addresses the issues that were solved in defining and implementing such standardized scheme. More information on SkyCat can be found at the SkyCat Web site.[1]

1. SkyCat Features

The ESO SkyCat Tool includes the following features:

- open and visualize a variety of FITS images including support for World Coordinate System (WCS), interactive measurement of offsets, and other standard visualization functions (SAOimage-like),
- overlay and edit color graphic objects on the image, like "tagging" sources with text, arrows, circles, or other graphic elements such as masks,
- PostScript color printing of the display (image + graphics),
- access and load an image from a network server of the Digitized Sky Survey scans,
- access and load catalog information from a number of popular astronomical catalogs, like the HST Guide Star Catalog,
- access local user catalogs,
- save catalog data locally,
- overlay catalog sources on an image,
- interact with Netscape to display more object information when available (support for Mosaic may be added in a future release),

[1] http://archive.eso.org/skycat

- access the observations catalog from the NTT, HST, and CFHT Science Archives,
- access SIMBAD and NED, both as name resolvers and for information on known objects,
- retrieve preview and other compressed images, and decompress them on the fly,
- load compressed images in hcompress, gzip, or UNIX compress format,
- retrieve and plot tabular preview data for a selected object as an (x, y) graph,
- calculate, display, and plot the center position, FWHM, angle and, other information for a selected star or object,
- access SkyCat features from a remote process via socket interface or via Tk "send,"
- access image header and data (FITS format) via SysV shared memory and/or mmap, and
- overlay RA/DEC grid on the image.

We are working on these additional features: (*i*) save canvas graphics, possibly as a FITS extension on the image file, (*ii*) user customizable symbols to "label" objects on the canvas, (*iii*) interact with a WWW browser to access catalog documentation and other documents, (*iv*) load lists of catalogs from sites (ESO, CADC, CDS, local) and allow user to select a preferred default catalog list, (*v*) save user preferences for look-up tables and other settings, and (*vi*) add or edit WCS parameters for a given image.

2. The Software

SkyCat was developed by ESO's Data Management and Very Large Telescope (VLT) Project divisions with contributions from the Canadian Astronomical Data Center (CADC). The tool was originally conceived as a demo of the capabilities of the class library that we are developing for the VLT.

This library consists so far of two major subsystems: (*i*) The Real-time Display (RTD) image classes with the RTD widget (see The Messenger, 81, 1995), and (*ii*) the Catalog Interface classes with the CatSelect widget. These constitute the basic building blocks of SkyCat. Early demonstrations of the tool to users were received so enthusiastically that we decided to polish things up, and produce the current version.

2.1. Java vs. Tcl/Tk

Some users might wonder why we did this development in the Tcl/Tk environment rather than in Java. The main reason is the pragmatic need to have the functionality implemented when the VLT comes on-line (mid-1997). However, great care has been taken to develop as much as possible in the short time with object oriented languages (C++, [incr Tcl]), having in mind that the future lies in tele-scripting rather than in the distribution of binary code.

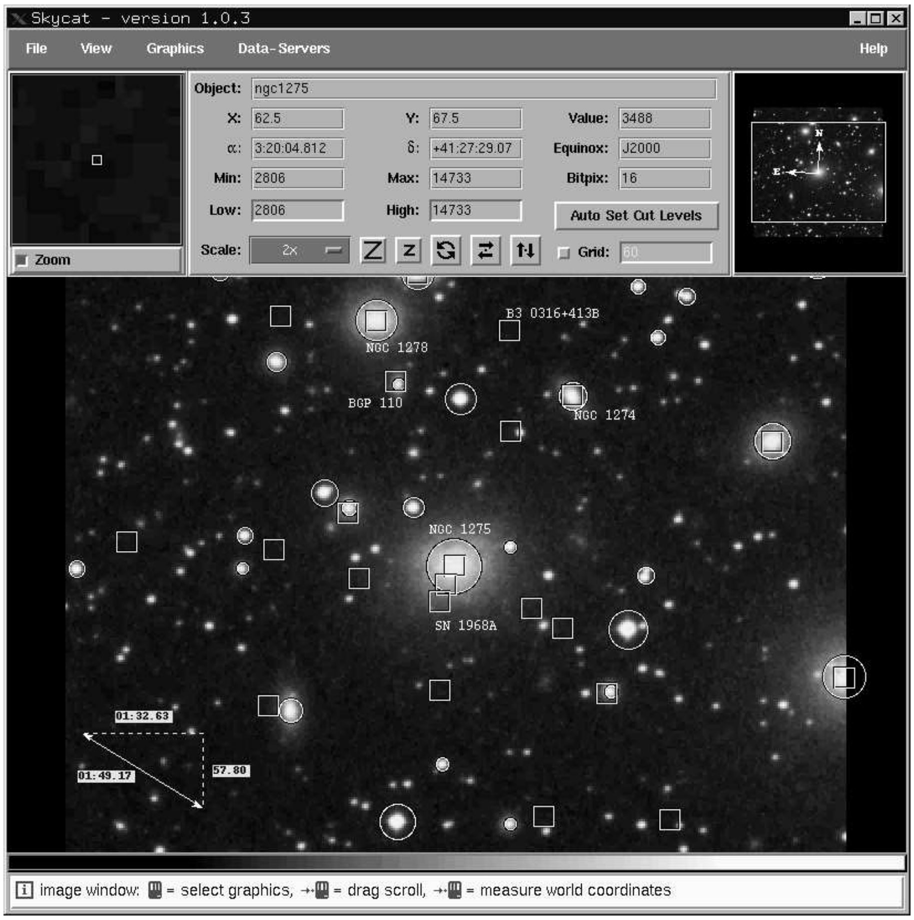

Figure 1. SkyCat showing a DSS image of NGC1275.

2.2. Distribution and Support

SkyCat is freely available to any users who want to download and use the software at their own risk. SkyCat is available as an executable for these platforms: (*i*) SunOS 4.1.3, (*ii*) HP-UX A.09.05, (*iii*) Solaris 2.5 (SunOS 5.5), and (*iv*) HP-UX B.10.10; ESO will maintain the latter two in the longer term—they are the platforms on which VLT software will run. ESO does not have the resources to port and maintain SkyCat on any other platforms. We will be glad to re-distribute any port that other people or groups may support, but decline any responsibility for them.

The software is also available as source code for research and other non-profit organizations. If you are interested in obtaining the package, please send us a note. Please report problems or send suggestions to malbrech@eso.org or to abrighto@eso.org.

Acknowledgments. We very much appreciated practicing wishful programming at large, i.e., wishing a utility, a function, or just a code fragment that would just do that bit you badly need, then surfing the net, fetching it, and re-using it in our code. Here is an incomplete list of packages that we either par-

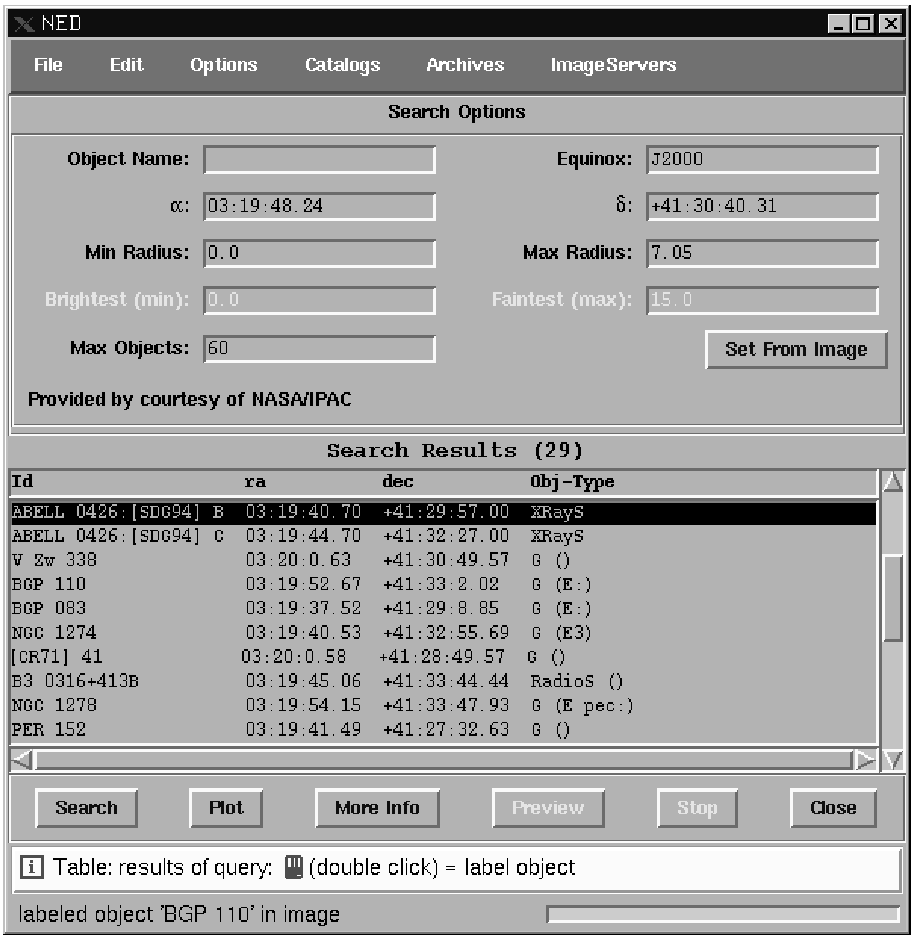

Figure 2. The CatSelect display of the field around NGC1275.

tially re-used or used as a source of inspiration: (*i*) STARCAT contributed many of its internals, (*ii*) Tcl/Tk, TclX, BLT and [incr tcl] give the glue around the C++ classes and widgets and Tk provides the canvas graphics, (*iii*) SAOimage lent the WCS lib, (*iv*) GSC server provided by courtesy of A. Preite-Martinez & F. Ochsenbein, (*v*) SIMBAD and NED client routines allow name resolving, (*vi*) the CADC "press" library is used to inflate compressed (hcompress, gzip, ...) images, (*vii*) Midas routines are used to calculate the centroid position, FWHM, and angle of selected stars/objects, and (*viii*) GNU Emacs routines are used to make a single binary executable from many Tcl/Tk scripts and data files.

References

Chavan, A. M., & Albrecht, M. A. 1997, this volume, 367