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The Scientist's Expert Assistant Demonstration

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Abstract. The Scientist's Expert Assistant (SEA) is a prototype effort for the Next Generation Space Telescope that uses a combination of artificial intelligence and user interface techniques to explore ways to substantially reduce the time and effort involved in proposal preparation for both scientists and the telescope operations staff. The Advanced Architectures and Automation Branch of NASA's Goddard Space Flight Center has been working with the Space Telescope Science Institute (STScI) to explore SEA alternatives. At ADASS '99 we were demonstrating the latest version of the SEA software. This article summarizes the new features and lessons learned in the SEA project over the last year.

1. Background

The Scientist's Expert Assistant (SEA)[1] is currently completing its final phase of prototype development. During the course of this project we have developed a central proposal browser and several visual components that allow users to develop their observing programs in a visual and intuitive manner. We have focused on visual components that can either be executed within an integrated environment or run independently. We have also been exploring the effectiveness of applying expert systems technology to guide users.

At ADASS '98 (Koratkar 1999) we demonstrated an earlier release of SEA. At the time, SEA supported only a single observation, had the basics of a graphical exposure calculator and a visual target tuner, and had a very limited expert system. Even then, we had found significant user enthusiasm for visual ap-

[1] `http://aaaprod.gsfc.nasa.gov/SEA/`

proaches. Over the last year, we have added features to the target tuner and exposure calculator, improved the overall proposal browser, and expanded the expert systems applications. We also added several new tools including: the orbit planner, the visit planner, and a context-sensitive help system. Our purpose in demonstrating SEA at ADASS '99 was to present these new features, gather additional feedback, and to explore collaborative possibilities.

2. New Features in the SEA

Here's a quick summary of the new features in SEA:

- The overall proposal browser has been enhanced to add table-oriented views of a proposal by exposures, visits, instruments, or targets. This allows an experienced user to quickly edit properties of their proposal through a table rather than the more intuitive, but lengthier, process of filling out forms.
- Context-sensitive help has been added throughout the system. Users can click on any button or field and display help information directly related to the selected item. The help content itself is evolving and contains a blend of interface-oriented and science-oriented assistance including one-click access to the appropriate links within detailed instrument handbooks.
- The Visual Target Tuner nows supports multiple apertures, and has a variety of 2 and 3 dimensional tools for analysis. Additional online image databases such as the Digitized Sky Survey have been added.
- A new component, the Orbit Planner, graphically assists users in laying out their exposures within a single HST orbit. It has the ability to establish links between exposures, and shows predicted overheads. With a simple "click-and-drag" users can re-arrange exposures, or change the duration of exposures. While nicknamed "Orbit Planner" because of its current space-based context, it was designed to be easily adapted to earth-based observing during a single night.
- The second new component, the Visit Planner, provides visual support for organizing all the exposures and visits in the entire proposal. Similar to the Orbit Planner, the Visit Planner allows the user to use "click-and-drag" technology to organize visits, exposures within a visit, and establish links or constraints between visits and exposures.
- The Exposure Time Calculator now supports spectroscopic exposures. It also contains new graphs such as comparing the target's spectral energy distribution to the throughput of the instrument configuration.
- A new Dither Planning Module represents the team's recent efforts to blend a visual tool and an expert assistant. This module's expert assistant runs in the background. It monitors data input and options selected by the user and provides suggestions and recommendations as needed. Greater details on the Dither Module can be found in these proceedings (Wolf 2000).

3. Lessons Learned

A major goal of the SEA project has been not simply to implement new features, but to gauge the effectiveness of these new features. The team is now prepar-

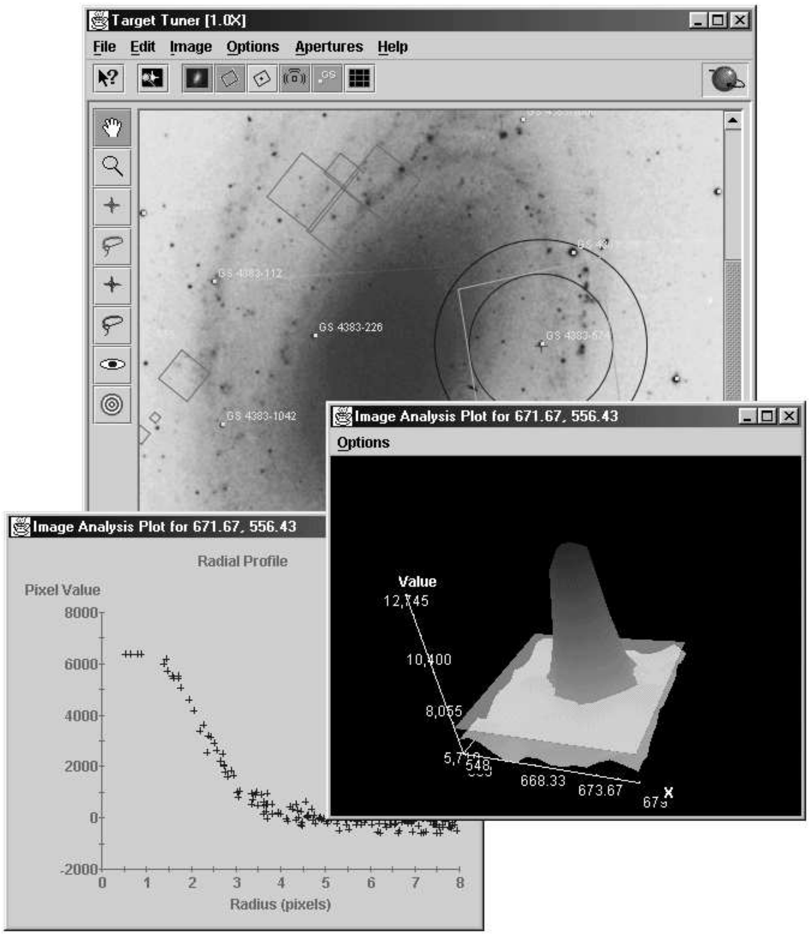

Figure 1. The Target Tuner's new visual tools.

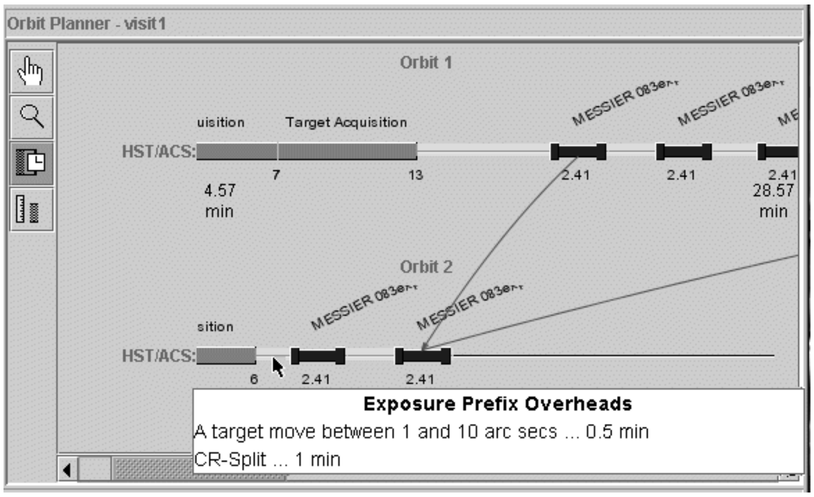

Figure 2. The Orbit Planner.

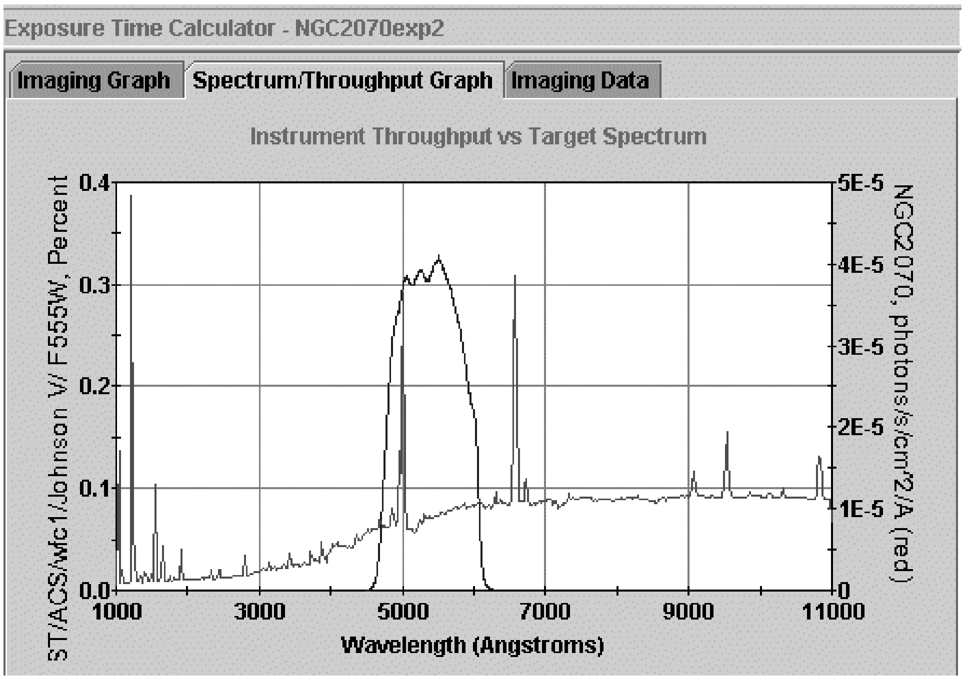

Figure 3. Throughput vs SED in the ETC.

ing for the project's final phase: evaluation. Even before we do our formal evaluation, we have already learned a great deal:

- Expert systems technology is improving, but it's still difficult to make it work effectively. Java-based rules engines exist and work, as do visual rule editors. But the actual development and testing of rules is still primarily a task better suited to programmers than astronomers. This makes developing rules difficult as very few people have both the programming and astronomical expertise.
- The visual approaches have a strong immediate favorable reaction from users. While the specific productivity and quality boost remains to be measured. We believe this impact is more than just a "whiz bang" effect, it provides a significant jump in intuitive feel of the tools.
- Collaboration involving reuse of tool components and an evolution towards common observing software suites could have a revolutionary overall affect on software costs.

References

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