Science Releases and Analysis Needs Assessment

I. Overview

- *DS7.3 release includes Repro III*
- *Ciao3.1 release & highlights*

II. Analysis Needs Assessment

- *Summary of the process*
- *Selected major themes*

III. Demos

- *Ciao scripts demo*
- *Point Source Aperture Photometry*
- *HETG Lightcurve Analysis via Interactive Filters*

I. Overview

- ***DS7.3 / Repro III release – pipeline/tool upgrades** includes*

  ACIS time varying gain applied
  ACIS+CC mode enhancements
  Destreak tool added to ACIS L1 pipeline
  HRC *AMPSFCORR* test added to correct some event positions
  HRC dead time factors corrected for double counting problem in rate-scalars

- ***Ciao3.1 release – tools to support ACIS bakeout** includes*

  acis_process_events - added time dependent gain correction

  mkacisrmf - new RMF generator

  bug fixes and enhancements - DM, science tools, UI, & Sherpa, documentation

Ciao 3.1 Highlights

II.1 Analysis Needs Assessment Process

1. Group members developed ~30 “Analysis Threads” in 3 areas and identified “Gaps” in analysis:
   - Grating Analysis
   - Imaging/Spectroscopy
   - Extended Source Analysis
2. SDS reviewed threads, assessed needs over the course of numerous meetings, and set priorities based on several criteria, including:
   1. Importance for scientific analysis
   2. Recurrence of science issues
   3. User support, user requests, HelpDesk
   4. Feedback from CIAO workshops
   5. Information from User survey, CUC
   6. Internal CXC review (in progress)
3. We identified several science-based themes.

•See “SDS Planning: Filling the Gaps” and the link to the “Analysis Threads” at: http://cxc.harvard.edu/cdo/cuc/cuc_file04/june04/melvis

Example: Data Analysis Thread

Thread T18 Multiple Point Source Aperture Photometry

Key	Task	Thread/Tool	Comments
√	Data Preparation	Various Threads	As Applicable: Tagging Bad Pixels; Filtering Background Flares; Destreaking; Updating Gain Maps; Applying CTI Corrections; Removing Pixel or PHA Randomization; Updating HRC AMP_SF/Tap-ringing;
"	Source detection with exposure maps	Dmcopy; wavdetect; mkinstmap; mkexpmap;	Multi-chip source detection with recursive blocking as in celldetect. Not ugly, just tedious. Need to run wavdetect with several scales at each of 3-4 blocking factors and for each desired energy band. For each binned image need to make congruent exposure map at appropriate energy. Adam wrote a shell script to do this for L3. Could be generalized, but very time-consuming to run. Some improvement possible with mask files (see below) which just define edges of detector, not actual eff area, but not clear this works as well as real expmap (research project).
"	Source detection with detector masks	Dmcopy; SExtractor; skyfov; dmimgcalc	Alternative to above step. Same recursive blocking, but expmaps not used. Edges defined by mask images, set to 1 inside detector fov, 0 outside. L3 tool runs SExtractor in recursive blocking mode and automatically makes masks. Much faster, but not clear if' as robust or reliable as previous step.
√	Merge multiple source lists	merge_src	Not really in CIAO yet, but in CIAOD – L3 tool to merge multiple lists from different binning/energies according to user-input merging rules.
*	Build src and bgd extraction regions	N/A	cf. acis_extract contributed s/w package, but use new enc. Energy vs. theta, phi, energy tables from CAL to determine PSFFRAC, instead of mkpsf. For user-input PSFFRAC and energy band, generate circular src and annular bgd regions for each source.
√	Review/edit extraction regions	Ds9; dmgroupreg	Display regions on image to check for overlapping regions. Adjust as necessary. Other regions, e.g., for sources detected at other wavelengths, can be added here.

Gap→

→ Feeds into several of our major themes

II.2 Major Analysis Themes for Future Development

- I. Flux. Tools to calculate/estimate flux and flux upper limits.
- II. Background. Tools to determine/model background; improved documentation. Initiated discussion with calibration group.
- III. PSF and LSF. Arfs for fractional psf; encircled energies; aspect tools; sub-pixel resolution; instrumental effects in conjunction with calibration group.
- IV. Pile-up. Diagnostics for pile-up, including gratings; improved documentation; mitigation.
- V. Combining Data Sets. Review of best methods, including appropriate statistical treatment; improved documentation/advice to users; tools to correct grating zero-order.
- VI. Timing. Tools for efficient filtering and binning; improved lightcurve accuracy; improved GTI correction for gratings.
- VII. Infrastructure. Various, e.g. improved region libraries.
- VIII. Extended Source Analysis. Improved documentation; script for spectral mapping, spectral deprojection.
- IX. Other. Miscellaneous, ranging “user pipeline scripts” to new spectral models.

Overview of SDS Planning Process and Analysis Needs Assessment[✸]

SDS Tasks include:

- Programmatic R&D
  - ✸ Algorithm Research & Development
    - Pipeline Tools (Level 0, 1, 2, 3)
    - ✸ Analysis Tools
  - Instrument and Calibration Support
  - Data Characterization
- Software Testing
- System Maintenance and Upgrades
- Supporting Users

SDS Deliverables include:

- File specifications
- Algorithm specifications
  - Pipeline Tool Specifications
  - ✸ Analysis Tool Specifications
- ✸ Documents
- ✸ Software libraries and tools
- Analysis Reference Data

- speed & stability improvements
- infrastructure enhancements including Chips
- L3 pipeline, etc.

1/04 CUC comments highlights

* Request for more demos with emphasis on science analysis
  - we include several demos of current analysis possibilities, and future analysis tools resulting from the Analysis Needs Assessment

* "getting the community to embrace S-Lang"
  - new web pages "S-Lang in Ciao"
  - workshop in 2005; presentations at meetings e.g. ADASS

*"take a lead at planning for commonality of e.g. software, scripting languages, etc."
  - initiated discussion with major centers
  - placed issue on ADEC agenda for Fall
  - ADASS presentations

III. Demos

- *Ciao Scripts demo*
- *Point Source Aperture Photometry*
- *HETG Lightcurve Analysis via Interactive Filters*