A Case Study: Multi-Sensor Data Analysis of HH Objects
Via STAR: A Scientific Toolkit for Astrophysical Research

The implementation of a "data visualisation" system developed at the Center for Astrophysics and Space Astronomy is intended to demonstrate how software tools can aid in astrophysical research. This system, STAR: A Scientific Toolkit for Astrophysical Research, provides the scientist a single environment for analyzing and combining information obtained from different instruments.

This poster presents a case study or scenario in multisensor research. Cooperative efforts between astrophysicists and computer scientists have been an integral part of the system development. By employing the four domains of astrophysical data analysis, namely access to data and databases; preprocessing; quantitative measurements; and data visualization, the authors were able to examine existing data on Herbig-Haro objects and determine if suspected objects had similar characteristics. Optical CCD image data, IRAS skyflux data and spectral data were integrated into this multi-sensor analysis.

Functions to support multi-sensor analysis, such as geometric transformations and various data visualisation techniques, have been incorporated into the STAR system. In addition, scientists are able to perform data transfer between different software packages such as AIPS and IRAF in order to take advantage of all available software. STAR is not intended to be a competitor to these packages, but rather a tool that allows the results obtained from each package to be viewed and analyzed simultaneously.

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Session 35: Detectors
Display Session, Conference Ballroom/Hall

35.01
Results From The DAO/CFHT High-resolution Camera
R.D. McClure (DAO/NRC), R. Racine (UdeMont/CFHT), M. Bolte (UCO/Lick Observatory)

An image-stabilizing, high-resolution camera (HRCam) has been in operation at the prime focus of CFHT during the last two years. This instrument provides fast guiding using a "tip/tilt" mirror at sample rates of up to several hundred Hz. Improvements in thermal environment and in optical alignment of the primary mirror of the telescope, combined with the use of HRCam have significantly improved the resolution for direct imaging. The median resolution for CCD images of point sources (FWHM) for 351 exposures over 15 nights in August 1990 was 0.75′. A similar result was obtained over a 7 night run in September 1989. A significant fraction of the exposures (~ 1/4) on these nights have sub-half arcsec resolution. In this presentation, we show some of the data obtained with HRCam, and discuss some of the programs requiring high spatial resolution that are being carried out.

35.02
Using Image Size to Control CCD Systematic Errors in Spaceborne Photometric and Astrometric Time-series Measurements
C.H. Booth, R.S. Hudson, and A. Buffington (UCSD)

We have investigated the effect of some systematic errors for high-precision time-series spaceborne photometry and astrometry, with a CCD as the detector. Binning of the images into pixels causes systematic error in astrometric measurements. We calculate this binning noise as a function of various image shapes. Sub-pixel response gradients, not correctable by the "flat field", and in conjunction with telescope pointing jitter, introduce further photometric and astrometric errors. We model sub-pixel gradients using observed properties of real flat field data. These errors can be controlled by having an image span enough pixels. Large images are also favored by CCD dynamic range considerations. However, large images can crowd together within the field of view, thus introducing another source of systematic error. An optimum image size is therefore a compromise between the competing factors.

35.03
SpectroCam-10: A 10 μm Spectrometer/Camera for the Hale Telescope
T.L. Hayward, J.W. Miles, J.R. Houck (Cornell University)

SpectroCam-10 is a 10 μm spectrograph and camera being built at Cornell University as a facility instrument for the 5m Hale telescope. The instrument will be optimized for operation from λ = 8 to 13 μm with three modes: a medium-resolution spectrograph (R = 2000), a low-resolution spectrograph (R = 100), and a camera with seeing-limited spatial resolution. A SIRTF-developed cryogenic rotating mechanism will accurately position a turret carrying the two diffraction gratings and the camera mirror, allowing observers to rapidly switch between modes. The initial detector will be a 10x50 Si:As BIBB array of the type being developed for SIRTF. The sensitivity of SpectroCam will enable detailed spectroscopic studies of faint sources, such as IR-luminous galaxies discovered by IRAS. We anticipate first light by summer 1991.

35.04
Observations with a Fiber Fed Automated Multi-Object Spectrograph (AMOS)
W. Craig (UC Berkeley), K. Cook, C. Hailey, J. Bixler (LNL), J. Brodie, H. Donnelly (Lick Observatory)

We have constructed a fiber fed multi-object spectrograph for eventual use at prime focus of the Shane 120" telescope at Lick Observatory. This instrument contains a number of unique components including its precise positioning capability and its 400x1200 pixel Reticon CCD. The instrument is now in regular use at the Nickel 40" telescope at Lick. In its current configuration AMOS can obtain spectra on 26 objects simultaneously, and can reconfigure fibers during telecope slew, allowing many fields to be observed in one night. The instrument has undergone extensive testing and calibration at the telescope. We report results of positioning tests which used precise autocentric positions to show a fiber placement accuracy better than 10 microns rms (0.125") at any point in the sky. As part of the calibration of the instrument we have obtained simultaneous radial velocity measurements taken on members of various open clusters. A program to obtain spectra on multiple filaments within several older SNRs is underway. The wide variety of spectral properties from filament to filament within a remnant makes multiple observations across the entire extent of a SNR desirable. The ability to take many simultaneous spectra, across the 20" field at the 40" telescope, allows many filaments to be studied in detail, adding significantly to the existing database. These spectra can constrain shock models and give insights into the detailed structure of the ISM. We present the first results of this program.