The Evolution of the FIGARO Data Reduction System

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The Figaro data reduction system originated at Caltech around 1983. It was based on concepts being developed in the U.K. by the Starlink organisation, particularly the use of hierarchical self-defining data structures and the abstraction of most user-interaction into a set of 'parameter system' routines. Since 1984 it has continued to be developed at AAO, in collaboration with Starlink and Caltech. It has been adopted as Starlink's main spectroscopic data reduction package, although it is by no means limited to spectra; it has operations for images and data cubes and even a few (very specialised) for four-dimensional data hypercubes. It has continued to be used at Caltech and will be used at the Keck. It is also in use at a variety of other organisations around the world.

Figaro was originally a system for VMS Vaxes. Recently it has been ported (at Caltech) to run on SUNs, and work is underway at the University of New South Wales on a DecStation version. It is hoped to coordinate all this work into a unified release, but coordination of the development of a system by organisations covering three continents poses a number of interesting administrative problems.

The hierarchical data structures used by Figaro allow it to handle a variety of types of data, and to add new items to data structures. Error and data quality information has been added to the basic file format used, error information being particularly useful for Infra-red data. Cooperating sets of programs can add specific sub-structures to data files to carry information that they understand (polarimetry data containing multiple data arrays, for example), without this affecting the way other programs handle the files. Complex instrument-specific ancillary information can be added to data files written at a telescope and can be used by programs that understand the instrumental details in order to produce properly calibrated data files. Once this preliminary data processing has been done the resulting files contain 'ordinary' spectra or images that can be processed by programs that are not instrument-specific. The structures holding the instrumental information can then be discarded from the files.

Much effort has gone into trying to make it easy to write Figaro programs; data access subroutines are now available to handle access to all the conventional items found in Figaro files (main data arrays, error information, quality information etc), and programs that only need to access such items can be very simple indeed. A large number of Figaro users do indeed write their own Figaro applications using these routines.

The fact that Figaro programs are written as callable subroutines getting information from the user through a small set of parameter routines means that they can be invoked in numerous ways; they are normally linked and run as individual programs (called by a small main routine that is generated automatically), but are also available linked to run under the ADAM data acquisition system and there is an interface that lets them be called as part of a user-written Fortran program.

The long-term future of Figaro probably depends to a large extent on how successfully it manages the transition from being a VMS-only system to being a multi-platform system.