

band are given, but essentially the same is observed in B and V.

In spite of a relatively larger scatter, it seems obvious that there is no phase dependence in the reprocessed light and a slight phase dependence in the 805 s modulation. The latter shows also a remarkable cycle to cycle variability. This may be seen from Fig. 3 where the mean short period light-curves are shown for two different nights. The 859 s modulation is practically the same on both nights and essentially not different from the overall mean. On the contrary, the 805 s modulation is almost invisible on one night and very strong on the other.

Apparently the site where the original radiation is being reprocessed is located far enough from the disk so that both illuminating and reprocessed radiations can travel to and from it practically undisturbed. The changes in the 805 s optical light modulation cannot be interpreted unambiguously: they can reflect the changes in its source as well as the changes in the system.

Another feature of H2252-035 which perhaps is worth mentioning is the stability of the 859 s period (and implicitly the 805 s period also). The present observations combined with previous determinations lead to the following light elements:

$$\text{HJD maximum} = 2445246.60275 + 0.009938388 \cdot E$$

The orbital period can be determined with less accuracy but its new ephemeris,

$$\text{HJD maximum} = 2445246.59480 + 0.14960 \cdot E$$

proves the constancy of the period over more than 5,400 cycles. The fact that the pulsar rotation period changes less than about $7 \cdot 10^{-7}$ cycle per year suggests that the rotating body is a white dwarf rather than a neutron star. The rotation of the pulsar is not bound – during one orbital period the white dwarf makes 16.05 revolutions – and this situation seems to be satisfying for the system.

In this note only fragmentary facts about H2252-035 are given; the full account of observations is in preparation.

The New Data Acquisition System for ESO Instrumentation

P. Biereichel, B. Gustafsson and G. Raffi, ESO

New instrumental control and acquisition software has been developed for the on-line minicomputers on La Silla. This has been done to allow easy portability of programmes between the various installations, to shorten the development time for new programmes, to ease software maintenance problems, and to provide the observer with a common, high-level interface to the various instruments.

Introduction

Over recent years, problems have often been experienced due not only to the ever increasing number of instruments, detectors, not to mention telescopes installed on La Silla, but also because the detectors and instruments themselves tend to be used in new configurations. The CCD camera, for example, was initially used only for direct imaging on the Danish 1.5 m telescope. Now CCDs are used, in addition, on the 3.6 m telescope for direct imaging (prime focus), with CASPEC (Cassegrain Echelle Spectrograph), with the Boller & Chivens spectrograph, (soon) with EFOSC (ESO Faint Object Spectrograph and Camera), and also with the Boller & Chivens and for direct imaging on the 2.2 m telescope.

Developments such as these can naturally lead to a software implementation and maintenance nightmare as well as making the instrument control often confusing to the observer. It is precisely these sort of problems that the new software package has been designed to cope with. The new software is therefore modular like today's instruments, and these modules, being independent of other parts of the system, are completely portable. The system comprises three main components: general-purpose programmes, libraries of subroutines, and protocols that govern the communications between the different parts. All of these components are detector-, instrument- and telescope-independent. Most of the programmes referred to are new, although a few are older ones that have been adapted to the new software environment.

The "user interface" is implemented by means of a Terminal Handler programme that is used by all instruments and provides a high-level standard interface to the user. This package allows an easy implementation of many desirable features such as the possibility of carrying out automatic sequences of integrations with pre-selected instrumental and telescope parameters.

This article is intended to give a general overview of the system. Full documentation is available from the TPE group, ESO Garching.

System Features

The new instrumentation software runs on Hewlett-Packard HP 1000 minicomputers, under the RTE-4B operating system. Fig. 1 shows a diagram of the standard configuration for an ESO instrumentation computer in the case of a CCD-based instrument. The software components of the data-acquisition system are shown in Fig. 2 and the main features are described below.

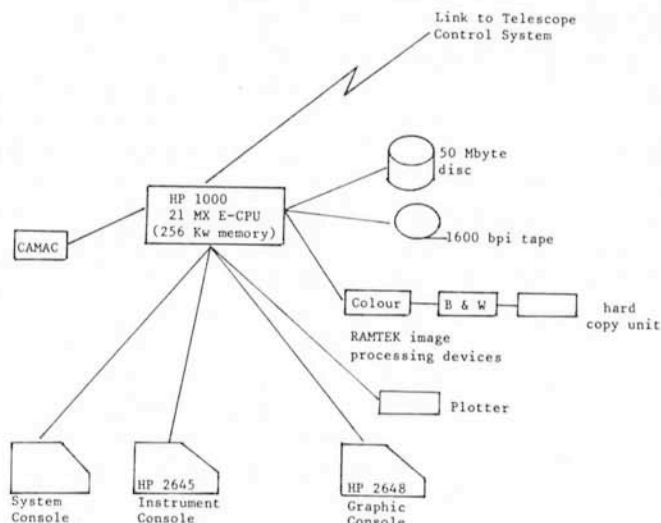


Fig. 1: ESO on-line instrumentation computer.

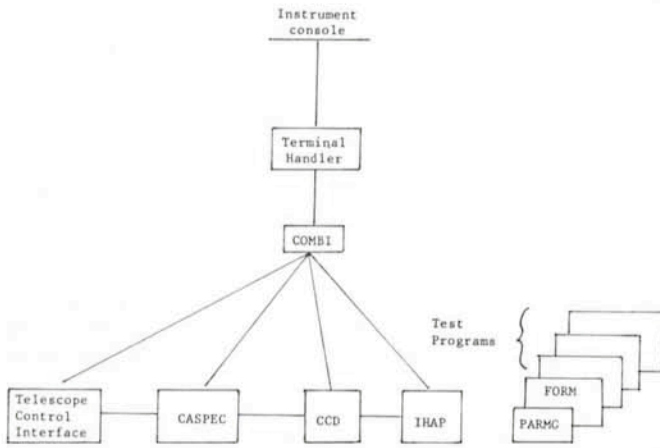


Fig. 2: Data-acquisition system components.

– The Terminal Handler programme coordinates and transmits commands and status information between the instrument

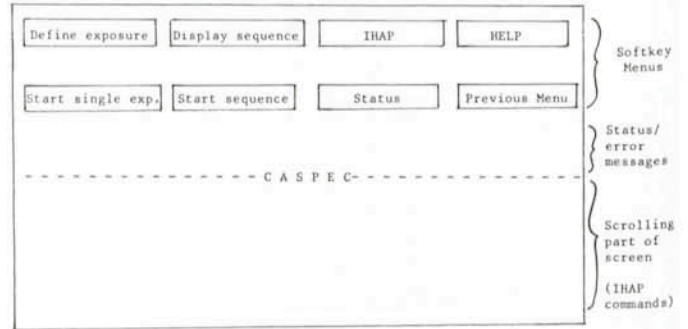


Fig. 3: An example of instrument control layout (from CASPEC). Note: Areas in □ boxes have white background (inverse video).

console and the various programmes involved. User input and output is by means of function keys (softkeys) and tables (forms). The instrument console displays, typically, a softkey menu at the top of the screen, followed by several lines of status and alarm information. The lower part of the screen is

<----- Exposure definitions ----->								<- Instr. setting ->				
#	TP	h.	mm.	ss	MT	Identifier	Batch::CR	#Exp	Y/N	LS	Slit	Density
1	DK	0.	20.	0	0	DARK	20S AVERAG	1 2	1 0	90.0	40.0	
2	CL	0.	1.	0	0	CALIBR. HEAR 1M	CCDSP\$	1 1	1 4	90.0	40.0	
3	FF	0.	2.	0	0	INTERN. FF 2M	AVERAG	1 5	1 2	90.0	40.0	
4	RE	0.	5.	0	0	NGC4594 5M	CCDSP\$	1 1	1 0	90.0	40.0	
5	RE	0.	20.	0	0	NGC4594 20M	CCDSP\$	1 1	1 0	90.0	40.0	
6	RE	0.	20.	0	0	NGC0055 20M	CCDSP\$	1 1	1 0	110.0	40.0	
7		0.	0.	0	0			0 0	0 0	.0	.0	
8		0.	0.	0	0			0 0	0 0	.0	.0	

<----- Telescope setting ----->									
#	Y/N	Ident.	hhmmss.s	Sddmmss.s	yyyy.dd	nnnn.mm	nnnn.mm	A/M	
1	0		0 0 0.0	0 0 0.0	.00	.00	.00	-	
2	0		0 0 0.0	0 0 0.0	.00	.00	.00	-	
3	0		0 0 0.0	0 0 0.0	.00	.00	.00	-	
4	1	NGC4594	123910.0	-1131 9.0	1983.00	.00	.00	M	
5	1	NCG4594	123910.0	-1131 9.0	1983.00	.00	.00	M	
6	1	NGC0055	014 6.0	-3917 0.0	1983.00	.00	.00	M	
7	0		0 0 0.0	0 0 0.0	.00	.00	.00	-	
8	0		0 0 0.0	0 0 0.0	.00	.00	.00	-	

TP=Exp. type, MT=tape recording, LS=Light source, #Exp=Number of exp. # =Relative sequence number, Y/N: Setting (Yes=1, No=0)

Fig. 4: Table for exposure sequence, as it appears when printed (from Boller & Chivens at 2.2 m telescope).

reserved for a scrolling display of IHAP and other commands (see Fig. 3).

– Control of the various instrument functions is effected by means of CAMAC microprocessor-based motor controllers which were developed at ESO. These are used by the instrumentation software to control either DC or stepper motors with different types of encoders and are interfaced to the control programmes via a library of standard subroutines.

– A generalized version of the parameter manager programme developed for the Coudé Echelle Spectrometer to define instrument parameter tables also forms part of the data-acquisition system.

– The CCD software package has been developed within this framework and is the kernel of all CCD-based instruments. The CCD software controls and monitors the CCD detector via microprocessor-controlled electronics. It executes exposures on instrument request and stores acquired data on disk and tape in either IHAP or FITS format, as required.

– The IHAP data-processing system is used for on-line data reduction. IHAP shares its data-base with the CCD programme so that data are written onto disk only once. It can be used from the instrument console, either via direct commands or soft-keys. The IHAP graphic terminal is used for instrument status displays, when IHAP is not active. The instrument and detector parameters are recorded together with data on disk and tape using a dictionary of FITS keywords.

– Communication among programmes is defined by a number of interfaces: Instrument/Detector, Data-Acquisition System/Telescope-Control System, Data-Acquisition System/IHAP. Messages are passed using a "mailbox".

What Do the Users Gain?

Although the system has been developed with the needs of maintenance engineers and designers in mind, the main focus of the development has been the eventual users of the system: the visiting astronomers.

Communication with the instrument, detector, telescope control software, and on-line data reduction are carried out from a single terminal as if they all formed part of one unique comprehensive package, while the complications of the multi-programme design are invisible to the user. Thus, the whole sequence of events needed to set up an observation – setting detector and instrument parameters, pointing the telescope and analysing previously acquired data during integrations – forms an easy to understand and natural process. The use of soft-keys and parameter-tables helps considerably in this respect and users can quickly familiarize themselves with the system without the need to remember dozens of parameters or use manuals. (A "Help" key is provided for every menu level.)

The system also provides ample scope for the advanced user to carry out more sophisticated observing procedures. Complete "observing programmes" can be pre-programmed in advance so that a sequence of integrations with different instrument settings and telescope positions can be executed automatically with the minimum waste of observing time. Multi-exposures at different focus settings is a special sequence that is available for direct imagery. Fig. 4 shows an example of a table to be filled in interactively to execute such an observing programme. This specifies exposures of different types (e.g. calibration, flat-field or star exposures) which can be repeated, sequenced and linked with IHAP batch programmes for immediate data reduction.

The use of a standard terminal without any hardware control panels, and the modular software structure will also allow the implementation of a remote-controlled version of the instrumentation software to be used for remote observing experiments.

The needs of the visiting astronomer might seem to conflict with those of the local engineering staff as the latter need maximum flexibility and must be able to enter individual control functions at a fairly low level. This need is supported by the intrinsic structure of the instrument and detector packages which are internally split in two modules. The "outer" module deals with the instrument logic in terms of tables and softkey management. The "inner" module can be considered as the instrument/detector "software controller". As such it receives and executes more basic commands of the type:

– CLOSE SHUTTER, LAMP 1 ON, DECKER 1230 (i.e. move decker to encoder position 1230).

Communication to these programmes is through what is called the engineering interface, and is implemented in terms of ASCII commands of the type shown above. The possibility to pass commands at this level is maintained when the "outer" software is operational and coexists with the higher level command-entry. Thus engineering commands for tests and maintenance can be entered at any time via the top level programme (the instrument programme as seen by the user), either directly or via test programmes accessible by means of the maintenance softkeys.

Conclusions

The new software system developed for ESO instrumentation supports:

- portability of software among instruments and telescopes
- automatic observing programmes



Giancarlo Setti, Head of the Scientific Division since 1 January 1982. This picture, taken by G. Vettolani on June 29, 1983, during the dinner offered by the Mayor of Medicina (where the radio telescope of the University of Bologna is located) to the participants at the Bologna IAU Symposium on VLBI, shows that G. Setti is still able to enjoy life.

– easy access to the engineering interface.

Thanks to the modular system structure, duplication of development effort is avoided and the number of programmes to be maintained is minimized. The new software has been developed as a by-product of the on-going instrumentation projects, with the aim of rationalizing the instrument software. While it is believed that this goal has been successfully achieved, some areas could still be further improved. In particular some work will have to be done to make instrumentation software suitable for remote control, even on a relatively low-speed computer-to-computer telephone link.

Acknowledgements

The authors would like to thank F. Middelburg for the additions to IHAP which have allowed easy interface to the new data-acquisition system. The on-line availability of IHAP considerably increases the power of the whole instrumentation software.

A special word of thanks is due to H. Pedersen for his recommendations and for his belief in fully computerized observing programmes, the Danish telescope CCD being the first example of this; and to M. Cullum for his careful reading of the manuscript.

Pulsating Stars, Spectroscopy and Shock Waves

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The pulsating stars constitute an important group of variable stars. They show in their spectra a large number of variations (intensity, shape, emission) which are very well observed with high-resolution spectrographs equipped with modern receptors. These spectral variations are the consequence of the dynamic state of the pulsating atmosphere of the star and their

study can certainly give some fundamental information. Here, in the first section, we give a rapid review of the observations of emission lines and their interpretation by the propagation of a shock wave through the atmosphere of various types of pulsating stars. Later, the $H\alpha$ emission of Mira Ceti, the brightest Mira star in the sky, is analysed. It is shown that the

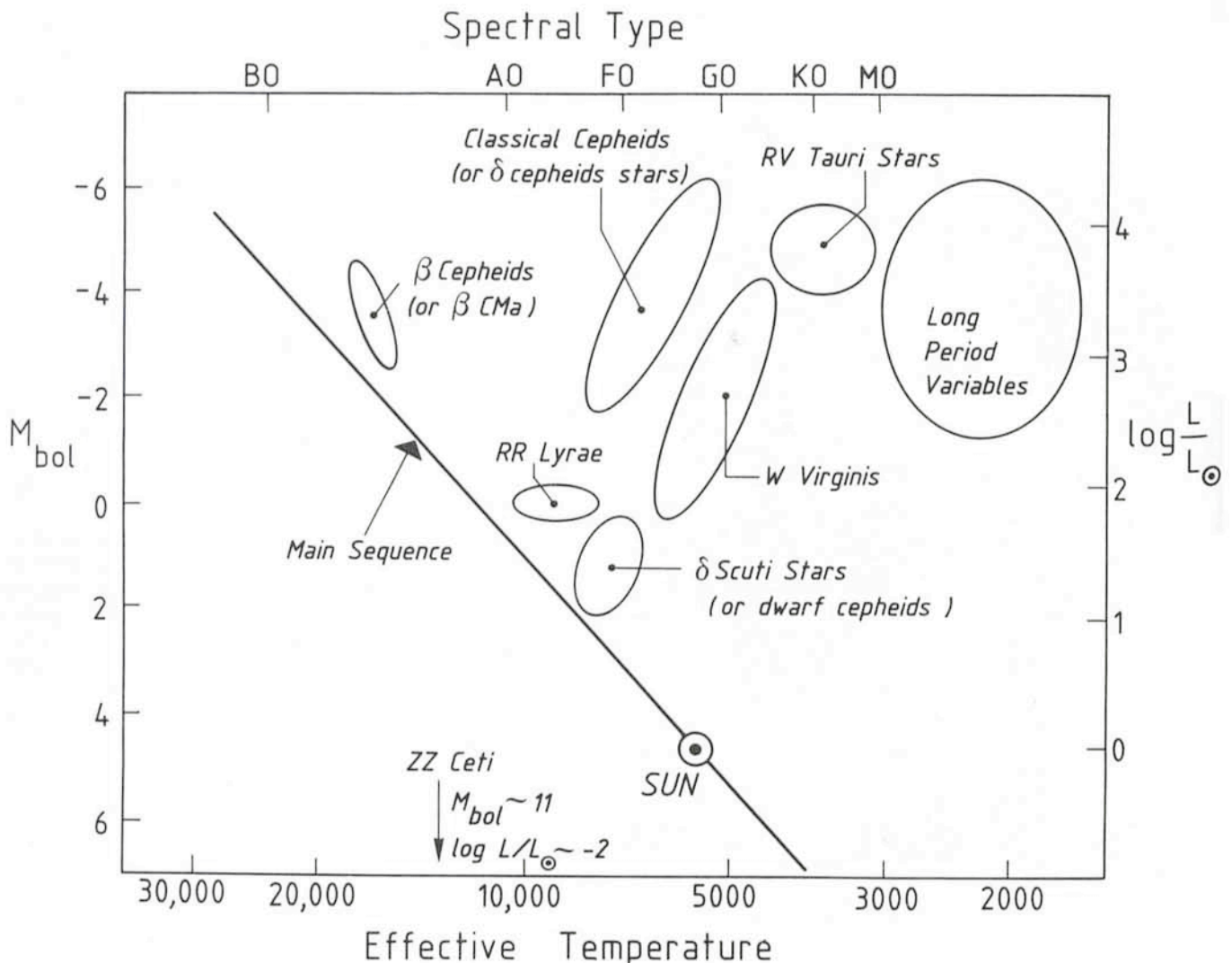


Fig. 1: Approximate location of the main groups of pulsating stars in the Hertzsprung-Russell diagram.