5. DATA PROCESSING

5.1 Data processing at the accelaration laboratory

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5.1.1 New Equipment

We expanded our computer cluster by two more workstations MIPS RC3230 based on the R3000 CPU and fully binary compatible with existing equipment.

In addition we bought several I/O equipment: a laser printer KYOCERA FS1500, a high-speed DAT tape unit, a scanner HP ScanJet II, and a color printer HP DeskJet 500 C.

Purchase of a new printer was necessary due to the very poor reliability and short maintenance intervals of the existing printer QMS PS2220 (just 1 year old!). We chose the KYOCERA printer mainly on account of environmental protection considerations: long lifetime of major components, minimal ozone production, low toner consumption, and minimal plastic waste to be recycled. The printer will be upgraded by a duplex unit to allow double-sided printouts.

The high-speed DAT tape (ARCHIVE) is mainly used for system backups and reduces the amount of time needed to do this job by a factor of two.

Mass storage has grown to 23 Gbyte during 1992, 8 Gbyte out of it being connected to the main computer CDC 4680. We currently use 3.5", 1 Gbyte SCSI disks.

5.1.2 Data Acquisition System "MLLE"

During this year eight MLLE systems have been put into operation: four systems equipped with a CAMAC interface to be used for online data acquisition, three systems for offline data analysis, and one MLLE with a special configuration dedicated to the laser group.

Five of these MLLE systems consist of fast 68030 CPUs including FPU, the other three are equipped with slower 68010 CPUs without floating-point unit.

A uniform setup procedure `msetup` is provided to define serveral paths needed to search for source codes, include files, system task, and libraries as well as command procedures and standardized error messages.

A program named `genmake` which is executed during MLLE's startup phase generates a so-called `makefile` to compile and link user-supplied tasks. In addition `genmake` may be used as a tool to create a `makefile` for any other program; this file then reflects the program's dependencies on header files, source codes, and libraries, respectively.

5.1.3 New Software

5.1.3.1 Licensed Software Products

Wingz

After testing the spread-sheet program `Wingz` for several months we decided to buy a five-users license for our main computer system. `Wingz` is a well-documented software based on X Window/OSF Motif to generate and manipulate spread sheets. It also supports grafical representation of one-dimensional data.

NAG Fortran Library

The NAG Library [1] is provided as the standard scientific package at our computer system. It is licensed under a campus agreement managed by the Leibniz Rechenzentrum.

5.1.3.2 Public Domain

A couple of freely available software packages have been ported to our computer systems. Most of these packages are in the public domain or are covered by some type of license allowing their free use (e.g. GNU General Public License). Other packages are restricted to cooperating sites like the CERN library.

Automounter `amd`

`Amd` [2, 3] is a tool for system adminstration. It does mounting of NFS file systems on demand using a centrally maintained map. This helps to simplify the administration of steadily growing computer clusters. We decided to port `amd` as the SUN automounter supplied by CDC did not prove stable in our environment. In addition `amd` has a more flexible configuration and may be ported to nearly any UNIX platform.

AucTEX

AucTEX [4] is a TEX extension to be used along with `emacs` and `lemacs` ("lucid emacs"). It simplifies writing of LATEX documents.

Cern Library

The Cern Program Library [5] is a large package of subroutines and programs for data evaluation used in high-energy physics. Porting this library to our computer system provided an easy way to analyze data sets from experiments done at Cern.

Fudgit

`Fudgit` [6] is a multi-purpose fit program. Its built-in fit algorithms are very powerful and flexible; in addition it may be expanded by used-defined fit algorithms. As `fudgit` has no native graphic capabilities its graphic output has to be directed to some existing graphic program by use of self-written macros. A set of macros interfacing `fudgit` to `gnuplot` is provided.

Gnuplot

`Gnuplot` [7] is a command-driven interactive function plotting program. It has flexible 2D and 3D plot capabilities including surface and hidden line algolrithms. `Gnuplot` supports a wide range of output devices including X11, PostScript^{TM}, and Embedded PostScript (EPS).

Ghostscript

`Ghostscript` [8, 12] is an interpreter for the PostScript^{TM} language. We use `ghostscript` to support output of PostScript^{TM} files to KYOCERA laser printers as well as to the HP DeskJet color printer. In addition it is used together with `ghostview` to preview PostScript^{TM} documents on the screen.

Unfortunately character fonts provided by `ghostscript` have a very poor design. As a consequence we acquired the licenses needed to install common PostScript^{TM} printer fonts. Using these original Adobe fonts `ghostscript` output shows no difference compared to original PostScript^{TM} printout.

Ghostview

`Ghostview` [9, 12] is a X11 interface for `ghostscript`. It allows easy selection of pages, orientation, and magnification. It is a convenient tool for previewing Postscript^{TM} files or selecting parts of a document for printing as long as these documents follow the Adobe document-structuring conventions.

Khoros (in cooperation with G. Ribitzki)

Khoros [10] is a large software package for image processing as well as 2D and 3D representation of histograms. Furthermore it provides powerful tools to produce contour and surface plots. Filters to read and write MLLE's histogram data are also included.

Khoros uses the graphic editor `cantata` to place different modules (filters, arithmetic and logic operators, numerical functions, and so on) in a workspace on the screen and to define connection rules between these components (Fig. 1). Although Khoros is not in the public domain it may be used freely. Development of Khoros is under control of the so-called Khoros Consortium, which is of similar structure as the X Consortium. As the Leibniz Rechenzentrum is a consortium member on behalf of the Munich Universities, there is no license restriction.

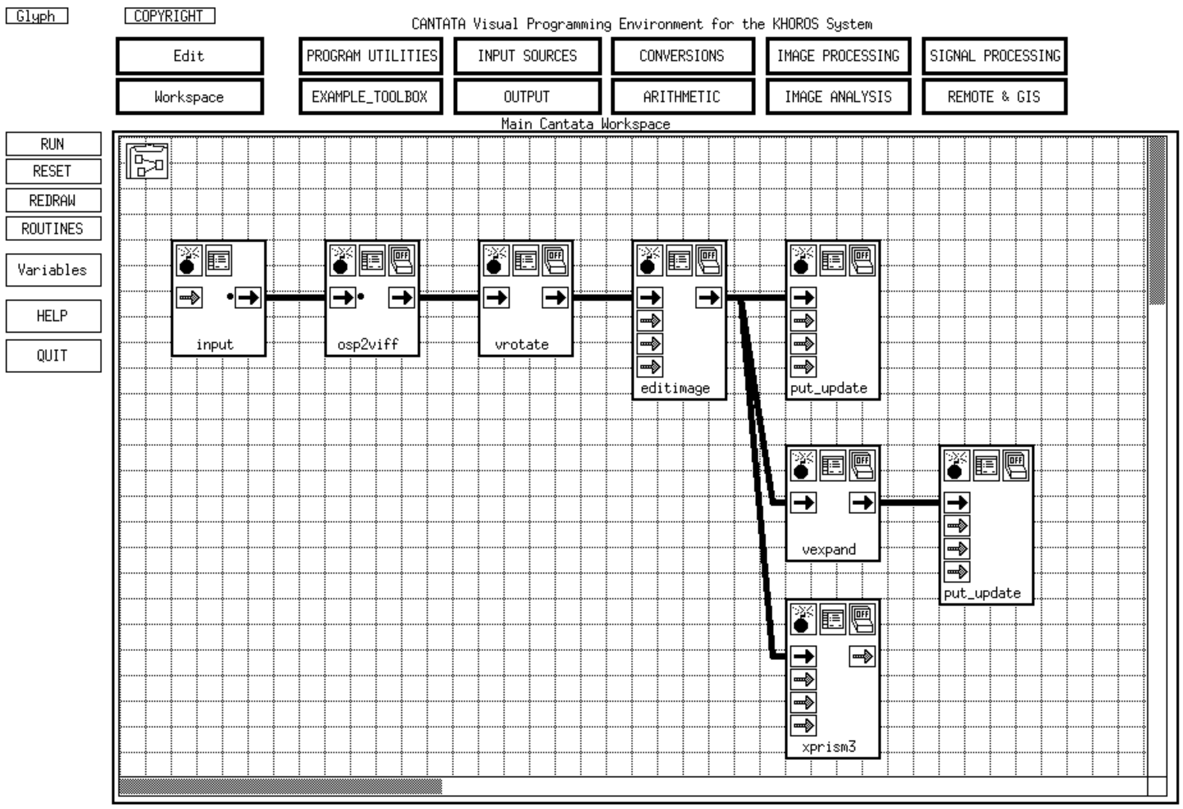

Fig. 1: Example of a Khoros Workspace

Lucid Emacs `lemacs`

`Lemacs` [11, 12] is an enhanced version of the popular GNU Emacs. It fits much better in the X Window environment than the original `emacs` does. Due to its expandability based on a built-in LISP interpreter it is a convenient tool to write source code for C and Fortran as well as LaTeX documents.

5.1.3.3 Software Development

Manual Pages

A set of header templates is provided to be used for uniform software documentation. Special control sequences may be included within these headers which later on will be scanned for to produce unix-style manual pages as well as PostScript^{TM} output.

Merging gsplot Pictures and Other Graphic Formats into LaTeX

The gsplot command fcopy generates a PostScript^{TM} file (extension .ps) which contains a so-called %%BoundingBox statement describing the size of the picture. It can easily be merged into a LaTeX file using style file psfig. The following lines show how to proceed (see [13] for more details):

```
\documentstyle[psfig]{article}
... [text or LaTeX statements]
\psfig{figure=file.ps, height=7cm}
... [some more text]
```

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[12] Free Software Foundation, 675 Mass Ave, Cambridge, MA 0213, USA

[13] CERN Computer Newsletter 207, May – June 1992.