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HYPPOCAMPUS: A HYPERCARD GRAPHIC INTERFACE TOWARD CAMAC & VME

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HYPPOCAMPUS: A HYPERCARD GRAPHIC INTERFACE TOWARD CAMAC & VME

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Abstract

We have implemented the standard ESONE CAMAC routines[1] as Hypercard[2] external functions (XFCN's), using MPW 3.1 PASCAL[3]. The routines are available in a demo stack, HYPPOCAMPUS (HYPercard POwer for CAMac PUShbutton), which is the software equivalent of the standard CAMAC Manual Controller.

A simple VME interface is also provided.

This work continues our attempt to use Hypercard as a powerful and simple human interface tool for data acquisition and control.

I. CAMAC, VME AND HYPERCARD

CAMAC

CAMAC is a well established data acquisition and control standard. Although newer systems are now available, a huge amount of CAMAC crates and modules is still present in research laboratories. One of the standard problems with CAMAC has always been testing and debugging in the laboratory. On the other hand, Hypercard is now a well known tool for assembling simple and reliable test systems. A further good reason for using Hypercard is its wide diffusion within the Macintosh world and its independence from big and expensive software environments.

We have developed a set of XFCNs for Hypercard 2 implementing the standard ESONE routines for CAMAC in MPW Pascal based on a set of CAMAC routines written by E.Wünsch at DESY[4]. There is no support for LAMs yet.

The hardware requirements are a MAC-II with MICRON[5] interface and one to eight MacCC-CAMAC-controllers[6]. In this hardware configuration all data transfers are restricted to 16 bit mode.

A diagram of the software structure is shown in Fig. 1.

VME

Using a MacVEE interface[6] it is also possible to access VME crates through two XFCNs, Peek and Poke, which implement 8-16-32 bit data transfer. Figure 4 shows the card for reading and writing VME memory locations.

II. Stack Layout

A demo stack, HYPPOCAMPUS, has been implemented. The first card of this stack (see Fig. 2) is the software equivalent of the well known CAMAC Manual Controller, with the advantages in simplicity and input output data presentation offered by Hypercard. Decimal to hexadecimal conversion (and viceversa) is available for the data. An additional card (see Fig. 3) adds the capability to build, save, load and execute macros made up of several CAMAC calls and single Hypertalk statements. On line help is provided.

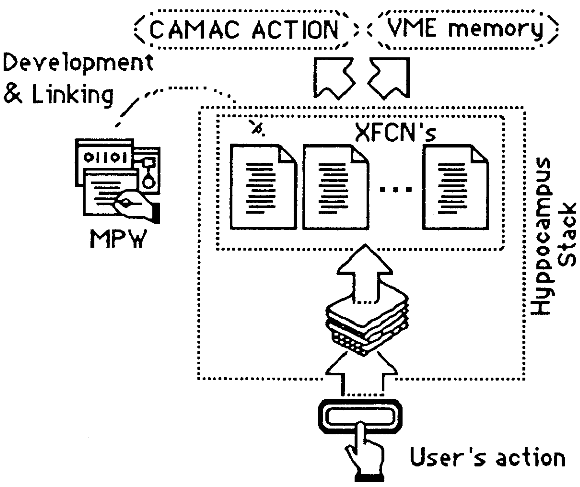

FIG. 1 - Software structure of HYPPOCAMPUS.

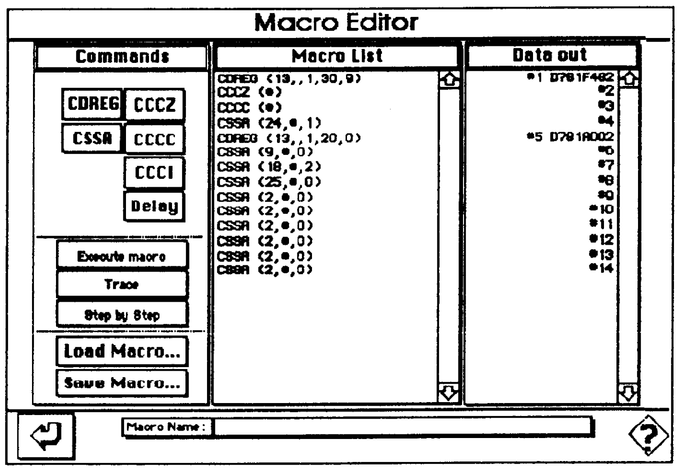

FIG. 3 - Card for CAMAC macro commands execution.

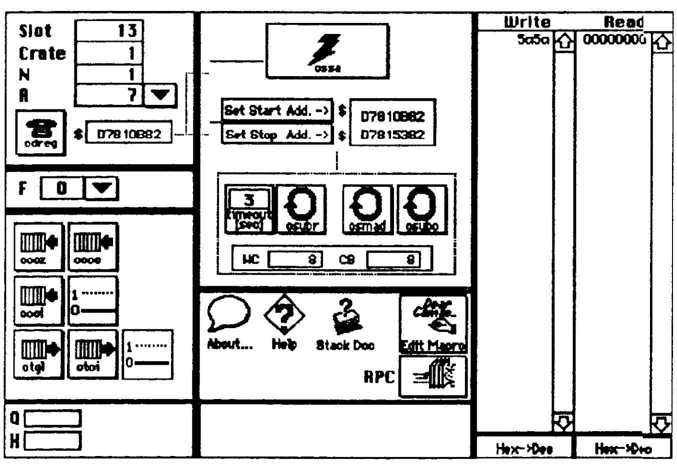

FIG. 2 - Software manual controller: buttons and pop-up menus reduce the use of keyboard to the minimum. On line help is provided.

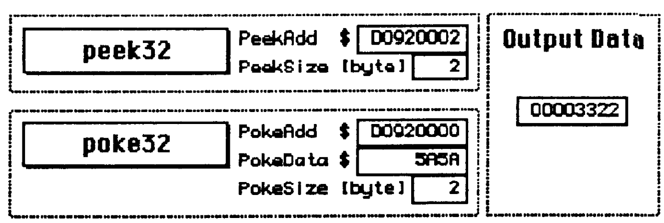

FIG. 4 - A tool for direct VME memory access.

III. THE ROUTINES

The use of a MICRON interface card as peripheral controller for CAMAC gives direct access to CAMAC instruments . The whole CAMAC address is encoded in 32bit. The parameters of that address are:

SLOT	the slot position where the MICRON card was plugged into the NusBus of the MAC-II , NuBus-Slot 9..E (default = D).
VMEcrate	the window number for the CAMAC address space (fixed to 7)
CRATE	the CAMAC crate address in the range 0..7
N	the CAMAC station number;
A	the CAMAC subaddress;
F	the CAMAC function code.

These parameters build a valid CAMAC address. Issuing such an address in an assignment statement gives direct access to the selected CAMAC register in all modes: control, read and write. The routine CDREG assembles all parameters except the F-code and creates the so called CAMAC-Variable (named EXT here).

The CAMAC-address is a 32bit pointer to CAMAC instruments. Therefore the Macintosh has to be switched to 32-bit mode when this pointer is used. This is automatically performed by the CAMAC_ESONE XFCN's.

The HyperTalk calling syntax for the implemented XFCN's is:

```
put CDREG (S,B,C,N,A) into EXT
put CSSA (F,EXT,DATA) into OUT
get CCCZ (EXT)
get CCCC (EXT)
get CCCI (EXT, L);
put CTCI (EXT) into I;
put CTGL (EXT) into L;
put CSMAD (F, EXTB,VDATA,WC) into CB;
put CSUBR (F,EXT,VDATA,WC,TOUT) into CB;
put CSUBC (F,EXT,VDATA,WC,TOUT) into CB;
put HexToNum (decimal) into hexadecimal (general);
put NumToHex (hexadecimal) into decimal (general);
put PEEK32(Add,Size) into IN (for VME);
put POKE32(Add,Data,Size) into DUM (for VME).
```

Where all input and output variables are any valid HyperTalk containers.

All error messages contain the word ERROR<CR>, which can easily be found by the HyperTalk construct:

```
put <XFCN's name> into OUT
if OUT contains "ERROR" then.
```

IV. An Application: Data Acquisition from *GLASS* Calorimeter.

The system has been tested and used in the Frascati Laboratories for a test of new detectors for the DAΦNE Φ-Factory: the digital calorimeter for low energies γ GLASS[7]. Backward Compton scattering of an Ar LASER light (Eγ=2.41 eV) against the high energy electrons circulating in the ADONE storage ring produces the γ-ray LADON beam in the range 20-80 MeV.

The GLASS calorimeter consists of 50 GSCs (Glass Spark Counters) interleaved by a 1mm thick Pb radiator foil, for a total radiation length of about 10 X_0. The sixteen parallel strips of each pick-up plane are connected to the front end digital cards. A total of 1600 digital channels (800 X + 800 Y) are read-out by a STOS [8] module. Eight TDC modules measure the time difference between the prompt signals derived from the calorimeter and a plastic scintillator.

A system controller and data acquisition stack has been derived from HYPPOCAMPUS by adding new cards and a few dedicated XFCNs (written in MPW C). These externals take care of direct read-out of the track patterns from the STOS module and of on line data processing such as array normalizzation and real time statistics.

Figure 5 shows the Initialization Card for the hardware settings and the file specifications (comments and saving rate).

Figure 6 shows the Acquisition Card with the track of a cosmic ray as detected by the GLASS calorimeter. From this card it is possible to replay a data file either is *single event* or in *free run* mode.

Figure 7 shows the on line histograms provided. The histogram fill facilitiy an a the track visualization can be turned off in order to increase the acquisition speed.

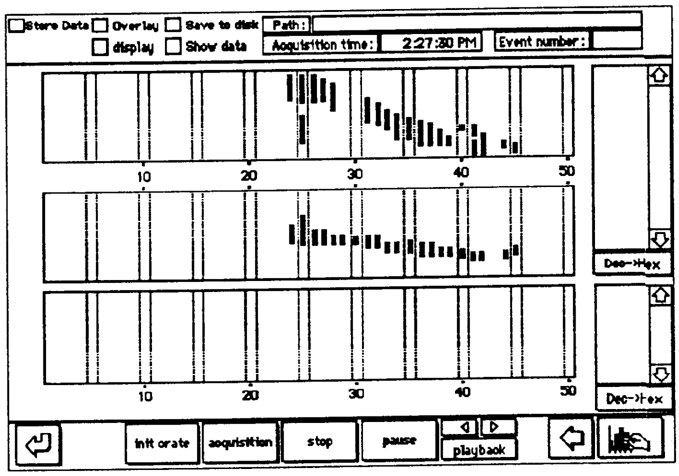

FIG. 6 - A cosmic ray track.

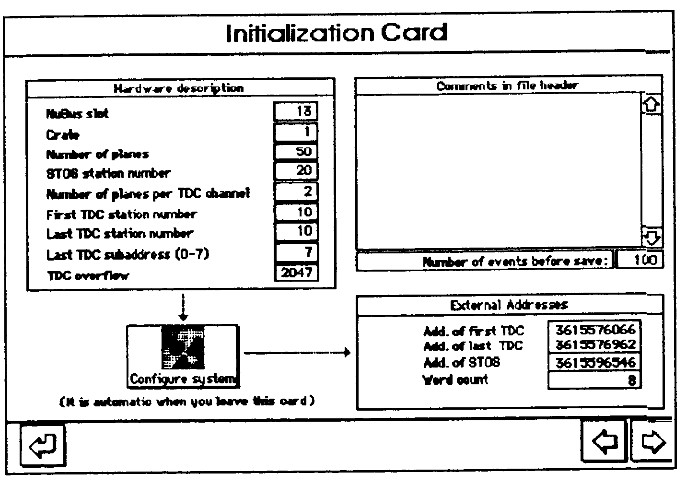

FIG. 5 - Hardware setting card for the calorimeter system.

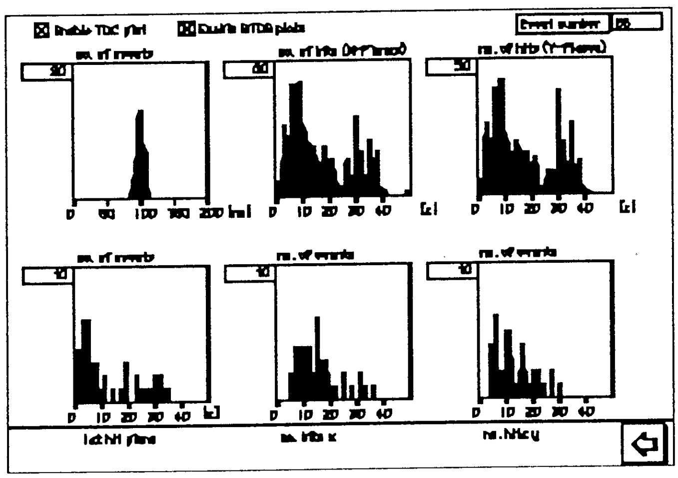

FIG. 7 - Real Time plots for on line system test.

V. Summary

Our experience with Hypercard in small control and data acquisition system development has proven extremely positive. The software can be built in a highly modular way as can be expected from the use of a real object oriented language (HyperTalk).

Where high speed and color graphics are not a first requirement the code can be developed entirely in HyperTalk: otherwise XFCNs, XCMDs and X-Windows can be added.

In any case we believe that Hypercard is a powerful tool for the fast and cheap development of system prototypes.

VI. References

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