Final Scientific Report for Instrumentation Award to principal investigator, Virginia Klema, Grant AFOSR-83-0305

Attn. of PKZB (Debbi Tyrrell) Department of the Air Force, Air Force Office of Scientific Research, Bolling Air Force Base, DC 20332

Nov 1984

The Instrumentation Award, Grant AFOSR-83-0305, to Virginia Klema permitted the fabrication of expanded concurrent computing equipment for research on numerical methods in a concurrent microprocessor based environment.

The VAX 11/730 acts as a file server for the microprocessor concurrent configuration. The Grant AFOSR-83-0305 permitted us to obtain the Intel 86/380 six processor configuration, one additional processor for the expanded 86/330 system, one additional processor for the 86/330 system, and the rom burner for the Intel development system. Rom chips, cables, and T-switches were obtained to complete this configuration. The configuration used for research on concurrent computing is shown in diagram form on the three succeeding pages of this report.

Our research concentrates on scientific applications, in particular signal processing and image processing. Experience with this flexible and configurable concurrent system provides the capability to devise new approaches to signal processing and image processing. Within the next year we expect to expand our research activity to problems in computational fluid dynamics. The concurrent computing environment permits research in operating systems and programming language constructs for numerical methods.

This microprocessor-based equipment is current state-of-science components. The key element in each processor is the Intel 8087 chip that has the binary standard, P754, for floating point arithmetic in hardware.

A key component of our future research will be the monitoring of performance in a concurrent environment. Furthermore, the tools for debugging in a concurrent environment must be designed and implemented.

The personnel presently associated with our research on concurrent computing are Elizabeth Ducot, George Cybenko, Virginia Klema, and two graduate students, Richard Kefs and Joseph Sebeny.
The Instrumentation award permitted the investigator to fabricate expanded concurrent computing equipment for research on numerical methods in a concurrent microprocessor based environment. The grant permitted the acquisition of the Intel 86/380 six processor configuration, one additional processor for the expanded 86/330 system, and the ROM burner for the Intel development system. The augmented system provides a concurrent computing environment that permits research in operating systems and programming language constructs for numerical methods.
CONCURRENT COMPUTING LABORATORY

*Configuration as of 9/1/82. Terminals and printers (not shown) are attached to each system with the exception of the Intel 432/600.*
ONE CONCURRENT WORKSTATION

SOFTWARE TASKER
LOCATES CODE AND DATA
MONITORS AND CONTROLS EXECUTION

EACH WORKER
ON-BOARD MEMORY
(PARTITION CONFIGURABLE)

MULTIBUS (TM INTEL) →

- 64 K ROM
- 192 K RAM
- 64 K RAM

LOCAL BUS

35 MBYTE HARD DISK

8086 CPU
8087 NDP

Availajb~21ty
Codes
Avail and/or
Special

MULTIBUS (TM INTEL) →

- 64 K ROM
- 192 K RAM
- 64 K RAM

LOCAL BUS

35 MBYTE HARD DISK

8086 CPU
8087 NDP

Availajb~21ty
Codes
Avail and/or
Special
<table>
<thead>
<tr>
<th>SYSTEM</th>
<th>CPU</th>
<th>MEMORY</th>
<th>LANGUAGES</th>
<th>STORAGE</th>
<th>COMMUNICATION MEDIA</th>
<th>OPERATING SYSTEM</th>
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</thead>
<tbody>
<tr>
<td>VAX 11/730</td>
<td>11/730 plus Floating point Accelerator</td>
<td>3 M Byte</td>
<td>BASIC, FORTRAN 77 C, APL, LISP, Ada* Cross Compiler</td>
<td>121 M Byte Winchester</td>
<td>1600 bit tape, Cartridge tape, Terminal (1200 baud modem)</td>
<td>Berkeley UNIX</td>
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<tr>
<td>INTELLECT SERIES II</td>
<td>ISDC 8085, ISDC 8086/8087 pair</td>
<td>576 K Byte</td>
<td>FORTRAN 77 ASM-86, PLM-86</td>
<td>35 M Byte Winchester</td>
<td>Floppy Disks 5.25&quot; KB (3) 8&quot; singlesided/ double density, Terminal</td>
<td>ISIS II (M)</td>
</tr>
<tr>
<td>Intel 86 330 &amp;</td>
<td>ISDC 8086/8087 pair</td>
<td>960 K Byte</td>
<td>FORTRAN 77 ASM-86, PLM-86</td>
<td>35 M Byte Winchester</td>
<td>Floppy Disk-IBM 8&quot; Configurable, Terminal</td>
<td>IRAX 86 Version 5</td>
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<tr>
<td>Intel 86 330 #3</td>
<td>ISDC 8086/8087 pair</td>
<td>Configurable Initial: 640 856 K Multibus, Up to 756 K Private</td>
<td>FORTRAN 77 ASM-86, PLM-86</td>
<td>35 M Byte Winchester</td>
<td>Floppy Disk-IBM 8&quot; Configurable, Terminal</td>
<td>IRAX 86 Version 5</td>
</tr>
<tr>
<td>Intel 432/600</td>
<td>ISDC 432/601 processors</td>
<td>512 K Byte</td>
<td>Native Code from AIDA*, VAR Cross Compiler</td>
<td>N/A</td>
<td>N/A</td>
<td>MIA</td>
</tr>
</tbody>
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