DEC VAXstations

Product Enhancement

Digital Equipment Corporation has added the single-user VAXstation 8000 to the VAXstation product line. The new workstation provides 3-dimensional graphics capabilities that are lacking on its other technical workstations. The system was jointly developed with Evans & Sutherland Corporation, an interactive graphics applications developer in Salt Lake City, Utah. The workstation will be manufactured by Digital and sold by both vendors.

Features

The VAXstation 8000 is packaged in a caster-mounted, deskside enclosure. It contains a six-slot VAXBI backplane which connects the CPU; disk, tape, and Ethernet controllers; and the graphics subsystem. One backplane slot is available for adding memory.

The VAXstation 8000 is based on a VAX 8250 CPU, which handles applications processing. The processor board also contains eight kilobytes of cache memory. Two MicroVAX II processors control I/O to disk, tape, and input devices. A third MicroVAX II processor controls the interface to the graphics subsystem.

The VAXstation 8000 supports up to 32 megabytes of memory, housed on two 16-megabyte memory modules, and 159 to 477 megabytes of disk storage on one to three 159-megabyte RD54 disk drives.

The VR290 color monitor features a 19-inch diagonal screen with a 13-by-11 inch viewing area. When used with previously offered VAXstations, the pixel resolution of the VR290 is 1,024-by-864. When used in conjunction with the VAXstation 8000 graphics subsystem hardware the VR290 has a display resolution equivalent to 8,192 by 6,912 pixels.

Input devices include a keyboard for text and command entry and a mouse for pointing. A dial box, available for the first time on a VAXstation, allows a user to directly manipulate an image displayed on the screen by mapping control attributes such as rotation, scaling, and translation to the dials with little CPU intervention. A standard Digital tablet can also be added to the configuration.

The Graphics Subsystem

Developed by Evans & Sutherland, the graphics subsystem consists of a six modules, including the structure memory, the structure walker, the geometry pipeline, the rendering processor, the pixel processors, and the frame buffer. Each module is dedicated to a particular phase of 3-D graphics creation and display.

The structure of an object is defined in a hierarchical display list which is stored in the 4-megabyte structure memory. Display data can be modified without requiring that the entire structure be rebuilt. A transformation matrix specified on the display list corresponds with a dial on the dialbox, allowing a user to change parameters in the display list in realtime with little CPU intervention.

The structure walker reads and interprets the stored display structure. The structure walker maintains a stack of graphics state information so that it can be saved and restored. When the data structure has been interpreted, graphics commands are passed on to the geometry pipeline to be processed. The geometry pipeline consists of a set of parallel processors, which perform standard graphics calculations. They also calculate depth and adjust line endpoints so that they match properly, contributing to image quality. The geometry pipeline processors have the ability to perform up to 104 million arithmetic operations per second.

The output of the geometry pipeline can be used to display wireframes or it can be passed through the rendering processor, which performs back-face removal, hidden surface testing, interpretation of lighting, and shading, resulting in a realistic interpretation of the object being modeled. A specialized 32-bit processor operating at a peak of 40 million operations per second gives the rendering processor realtime graphics performance.

The last step for both wire frames and rendered polygons is to pass the graphics data through a set of sixteen pixel processors which perform antialiasing (the elimination of jagged edges from curved lines, resulting in

© 1988 DATAPRO RESEARCH CORPORATION, DELRAN, NJ 08075 USA
REPRODUCTION PROHIBITED

DEC VAXstations

Product Enhancement

better image quality), color interpolation, and parallel writes into the frame buffer. The pixel processors operate at a peak of 263 million operations per second. The result is an image of 8,100 by 6,900 pixels of apparent resolution.

The pixel processors write output to corresponding pixels on the frame buffer, which consists of 58 planes and 1,024 by 1,024 pixels. Of this, 1,024 by 864 lines drive the VR290 monitor. The remaining 1,024 by 160 lines are used for off-screen storage. Ten bit planes are used for control, while the other 48 are used for various functions, including display, buffering, and color coding.

The output of the frame buffer goes to the video control system, which converts stored digital data into analog signals for display.

Software

The VAXstation 8000 runs both VMS Version 4.6 and ULTRIX-32. ULTRIX-32 includes the Sun Microsystems Network File System (NFS), which allows file and data sharing throughout a network. Both operating systems support Digital's High Performance Workstation Software (HPWS), which includes the industry-standard X Window System Version 11, developed by MIT, and the Structured Graphics Routines (SGR), a set of native 3-D graphics primitives. The VAX Programmer's Hierarchical Interactive Graphics System (PHIGS), an industry-standard subroutine library, is supported as a layered product.

Local Area VAXcluster (LAVC) software will be available for the VAXstation 8000, allowing its integration into LAVCs of other diskless or disk-based MicroVAX systems and larger VAX systems.

Price

A VAXstation 8000 configured with 16 megabytes of memory, a 159-megabyte disk drive, 95-megabyte streaming tape drive, 19-inch color monitor, keyboard/mouse, 8-knob dialbox, Ethernet adapter, VMS, High Performance Workstation software, and DECnet licenses, with a one-year warranty is priced at $87,710.

Analysis

The VAXstation 8000 is yet another example of Digital joining forces with another vendor in order to acquire the technology required to create a more competitive product. In the past, these joint development efforts have centered around the development of applications by third-party vendors. More recently, with its alliance with Apple Computer to integrate the Macintosh II into DECnet environments, Digital has begun joining forces with vendors that can provide specific hardware solutions to fill out its marketing strategy.

In order to produce a more powerful workstation, Digital went to Evans & Sutherland to develop a graphics subsystem which would perform 3-D modeling. Though an active contender in the technical workstation market, Digital has been outdistanced by Sun Microsystems and Apollo Computer, which have offered 3-D graphics on their workstations while Digital's VAXstation line topped out at 2-D graphics. Sun Microsystems has also captured the undivided attention of the industry with its 10-MIPS RISC architecture-based workstations, while Digital lagged behind at 3 MIPS on its previous high-end workstations, the VAXstation 3200 and 3500.

With its new VAXstation 8000, Digital is not, however, quoting MIPS ratings—perhaps because the workstation is based on a VAX 8250 CPU rated at approximately 1.2 MIPS. Instead, Digital is emphasizing the visualization performance of the new high-end workstation and its ability to perform realtime 3-D modeling for applications such as dynamic analysis, kinematics, and finite element analysis.

Digital also stresses the VAXstation 8000's compatibility with the rest of the VAXstations, MicroVAXs, and VAX 8000s, which allows it to integrate into existing networks and workgroups of Digital systems. Based on the VAXBI bus, the VAXstation 8000 also supports the same peripherals as the VAX 8000 systems and indicates further implementation of the VAXBI architecture at the low end of Digital's product line. ■

© 1988 DATAPRO RESEARCH CORPORATION, DELRAN, NJ 08075 USA
REPRODUCTION PROHIBITED