Microsoft Updates Multimedia Roadmap

New Features in DirectX API Improve Windows Support for 3D Graphics

by Peter N. Glaskowsky

Microsoft's DirectX application programming interface (API) is responsible for almost all of the multimedia features in every Windows operating system. Last month's "Meltdown," the DirectX developers conference, featured the arrival of the first beta version of DirectX version 7.0 (DX7) and provided the first public disclosure of many features in the new API. Microsoft also described plans to improve the user experience for PC games, creating a "Drop and Play" environment more like that found on console games.

Some of these features reflect recent innovations in multimedia hardware, while others point the way to future hardware and software products. Companies in the PC multimedia industry must move quickly to keep up with the rapid pace of evolution in 3D graphics, audio, and video technology. No company is under greater pressure to adapt to these changes than Microsoft.

Microsoft Offers Schedule for Next Consumer OS

Microsoft's plan to base its next consumer-oriented operating system on the Windows 98 core rather than on Windows 2000 (see MPR 5/10/99, p. 20) has more to do with multimedia support than the company previously disclosed. Microsoft says that architectural differences between Windows 2000 and Windows 98—such as differences in task prioritization, multiuser support, and memory protection—can make it difficult to make gaming titles work the same way on both operating systems.

At Meltdown, Microsoft announced that it no longer expects developers to target Windows 2000 as a consumer gaming platform, though the company continues to advocate the use of Win2000 as a development platform. Though Win2000's superior memory protection and task isolation make it well suited to compiling and debugging applications, final testing must still be performed on the Windows 98 platform, which most consumers will use for at least the next two years.

Microsoft says its next consumer operating system (as yet unnamed) will be released next April or May. This release will include version 8.0 of DirectX. The company conducted a preliminary design review for DX8 at a confidential event following Meltdown; a public announcement of the DX8 feature list is expected at Meltdown 2000, early next year.

Also at Meltdown, Microsoft confirmed its longstanding policy that DirectX will not be offered for non-Microsoft operating systems such as MacOS or Linux. The company regards DirectX as a competitive advantage of Windows, one it is not prepared to sacrifice in favor of establishing broader standards for multimedia software development. The high-level portions of the Fahrenheit 3D API will, however, be made available on other operating systems as part of the Fahrenheit development deal between Microsoft, SGI, HP, and Intel (see MPR 12/29/97, p. 17). Fahrenheit is now slightly behind its original 1H99 release schedule, but an alpha version has been released. A beta version is scheduled for a fall release, and the production version will follow that.

New 3D Features Match Hardware Vendor Plans

DirectX 7.0 formalizes Microsoft's support for hardware features already present in some 3D-graphics chips. Demonstrations of these features at Meltdown provided a compelling illustration of just how quickly new features are being developed by hardware vendors, and of how eager game developers are to adopt them.

DX7's long-awaited support for hardware acceleration of transform and lighting (T&L) operations was demonstrated publicly for the first time on hardware from 3Dlabs. Though 3Dlabs' multichip implementation was not representative of the faster single-chip solutions we expect to see from Nvidia and other vendors later this year, the demonstration showed that hardware T&L will allow 3D games to use more detailed models and more sophisticated physics-based simulation techniques.

In anticipation of future chips with T&L and rendering engines, Microsoft chose to merge the T&L interface and the rendering interface into a single device-driver model. This may make it more difficult for add-in graphics-board vendors to mix and match T&L chips with rendering chips. With most of the top graphics-chip companies planning to introduce integrated solutions, however, OEMs and users are still likely to have an adequate selection of T&L-accelerated products.

To benefit from hardware T&L, software developers will have to use the Direct3D (D3D) pipeline for T&L calculations. While most of today's games use proprietary T&L code to achieve the best possible performance, hardware T&L acceleration will give developers a reason to use the D3D interfaces instead. The software model for T&L acceleration in DX7 uses vertex buffers, a collection of three-dimensional vertices using a common coordinate system. DX7 allows the graphics card to retain these buffers in local or system memory from one frame to the next, changing only the T&L calculations when needed.

Another new feature in DX7, known as vertex blending, allows the software to specify multiple transform operations, each associated with a weight coefficient. By altering these weights from frame to frame for the elements of an object that connect otherwise rigid structures (such as elbow

joints), objects can be made flexible without creating visible seams. Microsoft says that a future release of DirectX will allow blending between vertex buffers, enabling object morphing without requiring the CPU to calculate the intermediate positions of each vertex, as morphing is done today.

Other improvements involve the rendering end of the pipeline. DX7 supports a feature known as cubic environment mapping found in some new graphics chips. As Figure 1 shows, this technique places each object inside a virtual cube composed of six square texture maps. When the object is rendered, the cube map is applied to the surface of the object.

Environment mapping can simulate effects that are much more difficult to implement in other ways. For example, reflection maps can be used to give an object a reflective surface without having to calculate reflections for each point on the object's surface. This effect is achieved by creating a cube map that contains a representation of the surrounding virtual environment as seen from the object. Environment mapping may also be used to create lighting effects without the need for lighting calculations.

DirectX Updated for Sega Dreamcast

Microsoft described version 1.1 of its Sega Dreamcast development platform, which uses Windows CE and DirectX. The new platform is said to be substantially improved over its predecessor and more competitive with Shinobi, Sega's primary Dreamcast platform.

The original Microsoft offering arrived later than Shinobi and was not as fast, missing out on nearly all of the early Dreamcast development projects. Microsoft says the new platform is easier to use, offers competitive performance, and has one valuable feature not available on Shinobi—support for networking. This feature allows Dreamcast to be used for Internet access and multiplayer gaming, applications of growing importance in the console-gaming market.

Shinobi remains popular among developers who don't need networking support, however, because it offers better support for the PowerVR-based graphics engine in Dreamcast. DirectX cannot take advantage of some of the unique features of PowerVR that developers use to implement special effects and boost 3D-rendering performance.

Microsoft believes the new development platform will help grow its share of Dreamcast title development, currently estimated to be about 20%, to at least one-third of all new titles by the end of this year.

Windows Game Manager Eases Install Problems

Microsoft seems to have learned some valuable lessons for PC software development from its work on Dreamcast—which we believe was one of the reasons Microsoft got involved in that project. The chief advantage of game consoles over PCs is the lack of installation and setup procedures. Console users drop in a game on cartridge or CD and immediately begin playing. Microsoft is developing a new operating-system component it calls the Windows Game
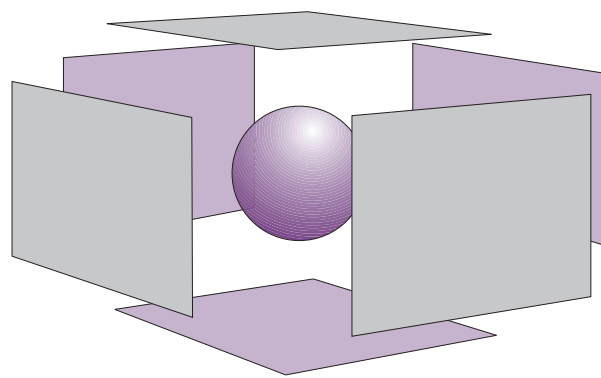

Figure 1. Cubic environment mapping uses six texture maps to represent the visual environment surrounding a 3D object.

Manager (WGM) to achieve a similar ease of use—according to the company, replacing "Drop and Pray" with "Drop and Play."

The WGM will automatically make room on the hard disk for any files that must be present there, "downsizing" any previously installed WGM-compatible titles that might be present, if necessary, to free up enough space. The WGM will communicate to the game what it knows about the user's hardware environment, including graphics performance profiling information and the user's preferences for input devices. The game will then adapt itself to this environment data without prompting the user, as today's games do, to select a graphics card, input device, button assignments, and 3D-rendering options.

The plethora of PC-compatible graphics cards and input devices may prevent the WGM from making the best decisions in every case, but it is Microsoft's goal to ensure that all WGM games can at least begin playing without user input. This is a laudable goal, and we wish Microsoft well.

The WGM will also implement a parental control system for PC gaming that goes well beyond the "V chip" system found in new televisions. The WGM will allow parents to restrict access to games, based on the levels of violence, sexuality, and language present in each game, for each member of the household. The WGM will not run games that exceed the assigned (and password-protected) limits, and it can restrict the amount of time per day each game can be played.

Microsoft Marches On

Microsoft makes substantial improvements to DirectX every year, and DX has become the preferred development environment for almost all PC multimedia software vendors. There continue to be holdouts for competing 3D APIs, such as OpenGL and 3Dfx's Glide, but these alternatives are falling further behind with each new generation of DirectX.

Features such as those unveiled at Meltdown '99 will only increase Microsoft's domination of this critical market. Whether this is good for the industry overall is a question for another time—but DirectX is definitely good for the Windows PC. ◫