ProQuest

Report Information from ProQuest

May 27 2021 15:16

SOMMARIO

New Sound Technologies for PCs

Barish, Jeffrey . Professional Sound ; St. Catharines, Ont. Vol. 9, Fasc. 6, (Dec 1998): 7.

Collegamento al documento ProQuest

ABSTRACT (ABSTRACT)

The author highlights improvements in audio subsystem technology for personal computers, mentioning the four Microsoft APIs (Application Programming Interface) related to sound, hardware, and what the future might hold.

TESTO COMPLETO

For many years, audio was the neglected media type in multimedia PCs. During the period that saw rapid advances in the graphics subsystem from monochrome to colour, from low resolution CGA to high-resolution XVGA, and now from 2D to 3D, audio made modest progress. From 8-bit monophonic to 16-bit stereo, from 8 kHz to 44.1 kHz bandwidth, and from beeps to FM and now to sampling synthesis.

However, audio is finally getting the attention it deserves. Consumers are demanding and computer manufacturers are delivering higher quality audio subsystems for this age of multimedia PCs.

Many small advances collectively account for the noticeable improvements.

Software Technology

The audio Functionality required in a PC is largely defined by the following four Microsoft APIs related to sound:

DirectSound

Content developers use DirectSound, a part of the suite of Microsoft DirectX APIs, for playing sound from a PC. DirectSound-collects the individual components of the intended output sound, mixes them together, and sends the mix to the audio buffers. DirectSound solves at least two problems that existed with the previous API for outputting sound. First, DirectSound is able to get the sound out to the codec more quickly -- known in the trade as "low latency" (this improves synchronization between audio and video). Second, DirectSound is able to mix several components together to produce a composite output.

DirectSound 3D

DirectSound 3D is the direct extension to DirectSound for interactively positioning sound around the listener. It can make it sound as if a jet is flying overhead or a monster is approaching from behind. DirectSound 3D not only increases the drama of game play, it can actually provide cues essential to play -- prompting the player to look behind. Multiple loudspeaker arrays are capable of improving on the experience. Most listeners find the surround effect more compelling when sound actually reaches them from behind. Furthermore, sensitivity to position and orientation of the head is reduced or eliminated, which has the additional benefit of making it possible for multiple users to share the experience.

DirectMusic

DirectMusic, part of DirectX 6, is the newest audio-related component of the DirectX arsenal. DirectMusic contains three components:

1. A wave table synthesizer -- which supports DLS, the Downloadable Sound standard created by the MIDI Manufacturers Association. Downloadable sounds solve several problems. They increase variety by permitting developers to create their own palettes rather than depending on a standard palette such as General MIDI (which provides only 128 musical sounds and 47 percussive ones). Custom palettes also maximize the sound quality achievable with a given amount of memory because they do not waste space on unneeded samples. Sound quality

is more consistent across platforms (including ones with hardware accelerators) because custom palettes avoid variations that arise when each synthesizer manufacturer uses different samples to render the instruments specified by General MIDI.
2. The second component of DirectMusic is an interactive music composition engine. This component makes it possible for content developers to specify musical accompaniment in terms of the desired style and musical characteristics -- and the developer can change these characteristics interactively by altering parameters that, for example, increase the tempo or add voices.
3. The last component is a set of authoring tools for creating interactive music scores and DLS collections.
DirectShow
DirectShow provides support for DVD-Video playback in PCs. It parses the MPEG-2 program stream into audio, video, and subpicture output pins. The audio stream is generally Dolby Digital (AC-3) encoded, so it must be decoded prior to rendering. The decoding is often done using dedicated chips, but it can also be done using software running on the host.
Hardware Technology
AC97
AC97 is a standard created by Intel, Analog Devices, Creative Labs, National Semiconductor and Yamaha for architecting the audio subsystem. It calls for the separation of the audio subsystem into two chips. The codec itself goes into one chip and any other circuitry goes into the "audio controller". As technology matures, we are seeing a segmentation of the audio controller. The audio controller used in basic PCs is no more than a bridge between the PCI bus and the AC97 link. A second tier adds some fixed-function hardware to accelerate basic functions such as sample rate conversion. High performance audio controllers have a digital signal processor to accelerate essentially all of the audio processing required.
MMX
MMX is a set of 57 new instructions for the Pentium processor designed specifically for the sort of number crunching required in digital signal processing. Computer OEMs, in their unending quest to reduce cost, are calling on the host CPU to perform some of the signal processing -- eg. a host-based wavetable synthesizer. The MMX instructions reduce the burden that such tasks would otherwise have imposed on synthesizer. There was a time when many system developers believed that the increasing speed of the CPU would make it possible to do all signal processing on the CPU. There are two flaws in this expectation. First, most DSP algorithms can be made to work better by throwing more computational horsepower at them. Second, system integrators are always looking for more things -- many of which involve DSP -- to do with their platforms. Thus, the requirements for number crunching tend to grow as the CPU gets faster. MMX helps by reducing the burden of any particular set of DSP functions.
The Future
Concurrency and Hardware Acceleration
The increasing speed of CPUs makes it possible to implement audio functionality entirely on the host ("Host Signal Processing"). However, when the host is required to support the signal processing requirements of several algorithms (e.g., sample-rate conversion, 3D positioning, and wavetable synthesis), the impact on performance can be significant. A 300 MHz Pentium processor spending half its time doing digital signal processing behaves to users like a 150 MHz Pentium processor. On the other hand, host-based solutions are easy (because they can rely on components that Microsoft provides in the "Hardware Emulation Layer" of DirectX) and inexpensive (no additional hardware). Consequently, this "audio is free" solution is appealing to computer OEMs for the "Basic PC" market segment.
DLS Enhancements
An industry group is taking the DLS specification to the next level. The current version of the standard was designed for compatibility with as broad a range of existing products as possible. The next version will call for enhancements that give content developers more precise control over sounds. Another related standardization

effort is MPEG4, which will specify not only a technique for compressing digital audio, but also a protocol for music synthesis and a way to specify the palette.

Better Music Synthesis Techniques

While all of these advances to the technology for music synthesis and audio effects will improve sound quality dramatically, new technology on the horizon will improve it even more. New music synthesis techniques are capable of synthesizing musical sounds that are even more realistic and expressive than wavetable. One such technique that has been around for a while is starting to make some inroads in commercial products. Wave guide synthesis is based on physical models of instruments. By programming these equations, it is possible to simulate the instrument electronically. Some parameters of the equations correspond to musically useful characteristics, such as the pressure of the bow against the string or the bite on a reed. Changing these parameters can alter the sound quality in ways comparable to what happens in the real instrument. On the downside, wave guide synthesis is more compute-intensive than wavetable synthesis, but faster processors will overcome this limitation. Also, it can be exceedingly difficult to create the physical models. The physics of instruments are very complicated, which is why it is still largely a mystery as to what makes a Stradivarius violin sound so good. Furthermore, it is almost impossible to know where to start in creating a physical model for an instrument called "Bright," which is one of the instruments required by General MIDI.

Conclusion

The audio subsystem of PCs is going through a transformation. Recent innovations in OS support -- APIs such as DirectSound, DirectSound3D, DirectMusic, and DirectShow -- and comparable innovations in hardware support -- MMX, PCI, and AC97 -- will account for much improved audio quality and a richer audio experience. And sound quality is going to get even better looking farther ahead as faster processors permit more sophisticated music synthesis and USB and 1394 make it possible to preserve the audio quality inherent in the digital representation.

DETTAGLI

Argomento specifico:	Computers, Technology, Audio equipment, Software, Computer Hardware, Predictions
Argomento generale:	Sound Recording/Processing/Systems
Titolo:	New Sound Technologies for PCs
Autore:	Barish, Jeffrey
Titolo pubblicazione:	Professional Sound; St. Catharines, Ont.
Volume:	9
Fascicolo:	6
Pagine:	7
Anno di pubblicazione:	1998
Data di pubblicazione:	Dec 1998
Casa editrice:	Norris-Whitney Communications

Luogo di pubblicazione:	St. Catharines, Ont.
Paese di pubblicazione:	Canada, St. Catharines, Ont.
Soggetto pubblicazione:	Music Business, Sound Recording/Processing/Systems, Music
ISSN:	1186-1797
Tipo di fonte:	Magazines
Lingua di pubblicazione:	English
Tipo di documento:	Commentary
ID documento ProQuest:	756574062
URL del documento:	https://www.proquest.com/magazines/new-sound-technologies-pcs/docview/756574062/se-2?accountid=12459
Ultimo aggiornamento:	2017-08-23
Database:	Music Periodicals Database

COLLEGAMENTI

Linking Service

Bibliografia

Citation style: IEEE - Institute of Electrical and Electronics Engineers

[1] J. Barish, "New Sound Technologies for PCs," Professional Sound, pp. 7, 1998. Available: https://www.proquest.com/magazines/new-sound-technologies-pcs/docview/756574062/se-2?accountid=12459.

Copyright database © 2021 ProQuest.LLC. Tutti i diritti riservati.

Condizioni di utilizzo Contatta ProQuest