



A codec message

In a step-by-step picture guide, Panicos Georgiades and Gabriel Jacobs show you how to set up audio codecs in Windows 95. Plus, your multimedia queries answered.

We have lots of your queries to catch up with this month, so let's make a start by dealing with a question sent to us by Peter Kenny. He writes: "Your article, in the October issue, referred to a number of compressed sound-file formats. I was interested in the GSM format which is, indeed, listed under Multimedia Properties in my Windows 95 system. However, when I tried to play the GSM sample from the CD-ROM on my system, nothing happened, although all the other samples seemed to work. Do I need to do anything to install the GSM codec in my system?"

"The reason for my interest in GSM is not altogether to do with multimedia, but rather because my data/fax/voice modem (US Robotics Sportster) records all voice messages in files with a .GSM extension. I have been trying to find out about the layout of these files because I want to translate them into .WAV files that I can play through my SoundBlaster-16 card. USR has been very unhelpful. Do you know whether these files are in the GSM format described in your article, or where I can get at any documentation of GSM (preferably on the internet)?"

You can check whether the GSM compressor has been installed on your system by clicking on the multimedia icon in the Control Panel and looking under the list of audio codecs. If it's not there, you can install it from the Win95 CD-ROM. If it is there, you can check its configuration settings by clicking on it. Our file is 44.1kHz, mono. The setting for decompression should be set to All rates.

GSM stands for Global System (for

Mobile (Communications) but the initials are taken from its earlier, French, name: *Groupe Special Mobile*. The Windows 95 bump states that GSM compresses and decompresses audio data conforming to the ETSI-GSM (European Telecommunications Standards Institute — *Groupe Special Mobile*) recommendation 6.10. The GSM 6.10 is a speech encoding system, used in Europe, that compresses 160 13-bit samples into 260 bits (or 33 bytes) — that is, 1,650 bytes/sec (at 8,000 samples/sec). A free implementation can be had on the net using ftp from tub.cs.tu-berlin.de, file /pub/tubmik/gsm-1.0.tar.Z.

Additionally, there are two US standards: 1016 (Code Excited Linear Prediction, or CELP, 4,800 bits/sec) and 1015 (LPC-10E, 2,400 bits/sec).

The GSM files created by your modem are probably of genuine GSM format, since GSM compression was made for telephony. But you really need to contact the people who wrote the software that comes with your modem and which creates those files, if you wish to decipher them yourself. We assume that your software doesn't have an option to convert them into WAV files. Some similar software, such as SuperVoice, does this for you.

You'll find many web sites offering GSM-to-WAV conversion programs. Do a Boolean search on GSM and WAV.

A useful reference

"I work for a company that produces electronic books consisting mainly of text and still graphics. We are very keen to offer more video and sound in our products, but are having difficulty in locating anyone who

can provide a digitising service. I would therefore be extremely grateful if you could send me a list of suitable companies."

Paul Cox, Oxford

See the PCW September issue for our review of the *Multimedia and CD-ROM Yearbook*, which contains about 1,400 businesses in the UK providing multimedia products and services. (See the "PCW Contacts" box, page 314, for details.)

Sound-card choice

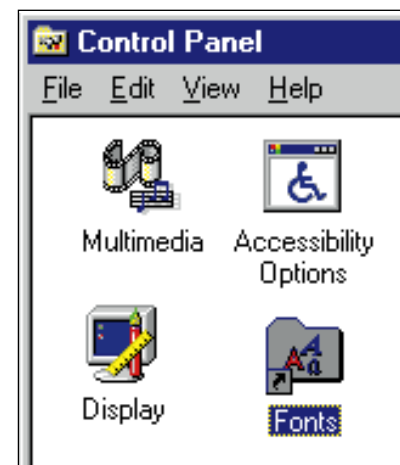
"I bought your book on MIDI, published by the Sigma Press in 1990, and I've been following the advice given in your column here in PCW, but I really need some help with specific questions. I've recently switched from being mainly a Mac user to owning a plug-and-play Win95 Pentium PC with Adobe Premiere, 3D Studio, and Animator Studio. I also have Roland kit from the cheap end of the range (CM32).

"I want a sound card with good built-in wavetable sounds, versatility, stable performance and a dependable MIDI interface. Sampling is something I'd like to do, but this is only one priority.

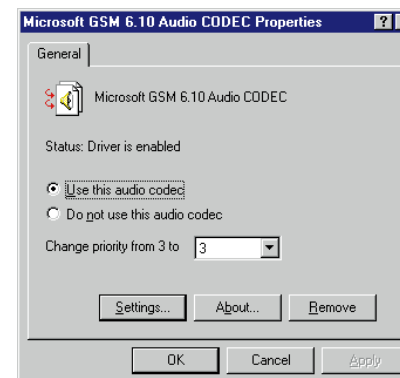
"I've read that some cards don't have hardware MIDI interfaces but use a software TSR to emulate it. This can cause MIDI sounds to fail if another TSR overwrites it. I've also read that cards without hardware FM synthesis emulate SoundBlasters in software — that seems like asking for setup headaches and conflicts. Although the option of digital output sounds useful, I don't know how I'd use it.

"I'd appreciate your guidance on what to buy, and I should say I've not seen straightforward buying advice in any

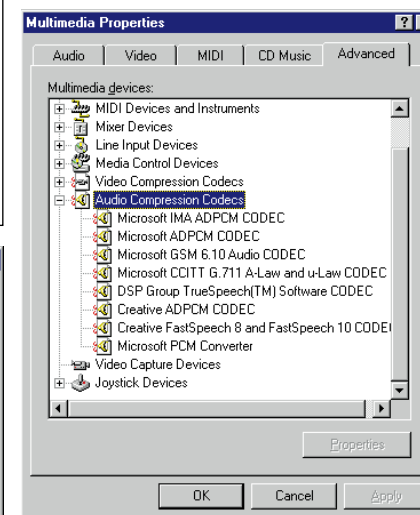
Setting up audio codecs in Windows 95 — your step-by-step guide



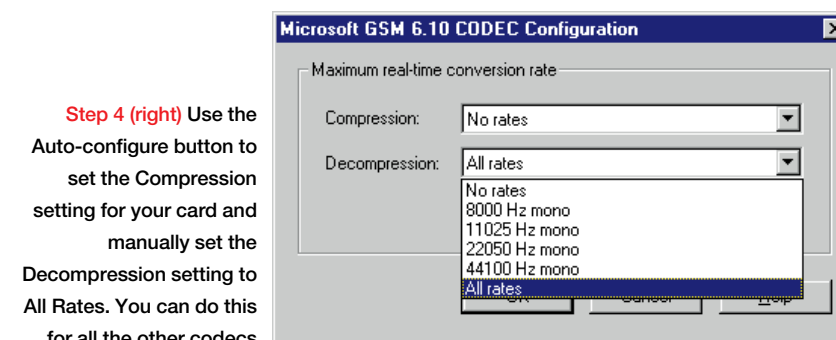
Step 1 (left) Open Multimedia in the Control Panel and select Advanced



Step 2 (below) Select GSM audio compressor from the Audio Compression Codecs



Step 3 (left) Click on Settings



Step 4 (right) Use the Auto-configure button to set the Compression setting for your card and manually set the Decompression setting to All Rates. You can do this for all the other codecs

computer magazine. Nevertheless, I've got a shortlist of five with some 'Fors and Againsts' that I've gleaned from reviews: it is as follows:

1. Turtle Beach TBS2000. Good sounds, good track record, but software MIDI interface. No daughterboard connector. Not easy to get hold of and a bit pricey.
2. SoundBlaster 32. Reasonable price for average sounds, RAM for sampling, good support (I think). Many users, digital output, but software MIDI. No sequencer supplied and no daughterboard connector.
3. SoundBlaster AWE-32. As above, plus reasonable software and daughterboard connector but overpriced (in my opinion).

Perhaps about to be replaced, and due for better synth chip?

4. Orchid NuSound. Good price, average sounds. Good package. Hardware MIDI, daughterboard connector (Orchid's board is only about £20) and NuPanel control panel. But sounds are not the best. No sampling, no digital output and perhaps due for a new card with sampling?
5. Gravis Ultrasound PnP. Good price for good sounds. Sampling, reasonable track record, hardware MIDI but no daughterboard connector. Software perhaps not as good as AWE and not so widely used. SoundBlaster emulation in software.

"And, while I'm asking questions: is an alternative to having a card with sampling, having an expensive sequencer which will mix synth sounds with digital audio sounds? I don't suppose it is because other software (games, Animator Studio) won't be able to play back a mixture of the two as the sequencer can."

Robert Wood
Open University

Lots of questions! We'll try and answer most of them. And thanks for those mini-reviews, although we can't comment on all the details.

Firstly, we should say that some of the views given in the articles in the magazines you've been reading are a bit dated and, frankly, not worth bothering about. Eleanor Turton-Hill's group test of sound cards (PCW April '96) is more up to date.

There's no need to worry about FM emulation and MIDI TSR emulation. These are related to programs running under DOS or strictly using the hardware MPU MIDI interface standard. Most cards come with Windows drivers which override, and/or render useless, any DOS drivers and settings.

The TBS2000 has the same kind of interface as the AWE-32. You can get it from Millenium Music, Tech-mate, Turnkey (see the "PCW Contacts" panel for details) and any of the Byte superstores.

The plain truth is that you won't find a single card that will do everything you want at the best quality. The best overall card which has most of what you want is the AWE-32 (the full version rather than the budget item) at about £170 (plus VAT), which is not expensive for what it offers. It's true that the on-board sounds are a bit thin, but they're no worse than the other cards you mention. A new version (AWE-64) will be out sometime in January with 64-note polyphony. An additional (more expensive) model, the AWE-64 Gold, featuring instrument modelling, will also be available in the New Year.

The best wavetable sounds we've heard on a PC card can be found on the Yamaha DB50 daughterboard (£129) which has an excellent MIDI implementation. You see, it's not just the quality of the samples, but also how much control you have over them during playback — if you want your music to have some expression, that is.

Sequencers need not be expensive

Dear Santa...



Before getting on to our Christmas wish list, let's take a brief look back at 1996. For us, it has been a year when computer companies have actually believed their own hype. Consequently, they have devoted huge efforts and resources to developing products for the internet. For instance, most multimedia authoring programs have had new features added to them, allowing users to create multimedia applications for the net. It has been our job to report on many of these, and in most cases we've been amused rather than impressed. Sorry, but the truth is that if you want multimedia, forget the internet. It's too slow even for still pictures, let alone sound and video. If you want to enjoy multimedia, get it on CD-ROM. Even when everyone has cable lines — with the 17Gb storage of a double-sided DVD (when it's out, if ever) — it will be decades before the internet can deliver comparable performance.

■ We wish the hype over multimedia on the internet would simply stop. Last year, one of our wishes was for full-screen video. So how far have we got? The new version of Adobe Premiere boasts support for 32 x 32 pixel video output for use on the net, and we bet that kids are asking their parents for a magnifying glass for Christmas so they can view it!

■ While on the subject of the net, we wish that web page designers would stop trying to show off and use less video and graphics so that pages would display faster. If you opt not to display graphics, you're left with an awful feeling that you might have missed something. We simply wish they would cut out the gizmos. After all, when you've seen one, you've seen them all.

■ We wish that Windows wouldn't ask us to press OK when there's nothing else to press and things are very far from OK.

■ We wish that when you get the message Abort, Retry, Fail, and you select Retry, something would actually happen other than the same message appearing again and again, until you press Abort or Fail.

■ We wish there was more hardware compatibility. We've spent more days sorting out hardware incompatibility problems with Windows 95 in the last year than we care to contemplate — Plug-it-in 'n Play "solve the problem".

■ We wish there were new typefaces designed specifically for reading text from a computer monitor, and that all programs (especially multimedia authoring tools) would anti-alias fonts on-the-fly.

■ We wish (every year, not just this one) that companies and organisations would stop announcing products before they have dreamed of them. CD-X and DVD were announced ages ago. Where are they? And where are the large flat-screen LCDs which we can hang on our wall — the ones we were promised last decade?

■ We close our eyes and wish hard for no more answerphones on customer support lines, and no more "musak". We want to talk to *real* people at the other end — people who know what they're talking about.

■ We wish for more and cheaper electronic pens to replace mice.

■ And finally, we wish that computer companies would concentrate on delivering what customers want, as they used to in the eighties, as opposed to concentrating on buying each other out, as they have been doing over the last five years. They've been so busy eliminating competition that they've brought stagnation to the computer industry; something which inevitably happens when there aren't enough manufacturers around.

nowadays to incorporate audio as well as MIDI tracks. Only if you want to manipulate your own original sounds as musical instruments (change the pitch and so on) do you need a card that handles sampling. The AWE-32 can use up to 28Mb of RAM, and there are lots of CDs with sounds for it. Steven Helstrip has reviewed some in his Hands On Sound column.

You only need a card with digital In/Out if you want to communicate with digital equipment such as an audio DAT machine. You should note that most digital cards are more expensive and don't have MIDI sounds on them.

To avoid setup headaches, go for a card for which the drivers have been around and well-tested for some time.

■ Please note: this is the last Multimedia column to be included in the Hands On section of PCW, but you will still be able to read all about the various aspects of multimedia in other parts of the magazine. Panicos Georgiades and Gabriel Jacobs will continue to write for us from time to time.

•PCW Contacts

If you have any queries, or interesting multimedia-related topics to discuss, we'll be pleased to hear from you. You can contact us at g.c.jacobs@swansea.ac.uk or panicos@dial.pipex.com

The Multimedia and CD-ROM Yearbook
Macmillan General Books 0171 881 8000

TBS2000 soundcard Millenium Music,
0115 9552200; Tech-mate 01206 793355;
Turnkey 0171 379 5148



Drive ways

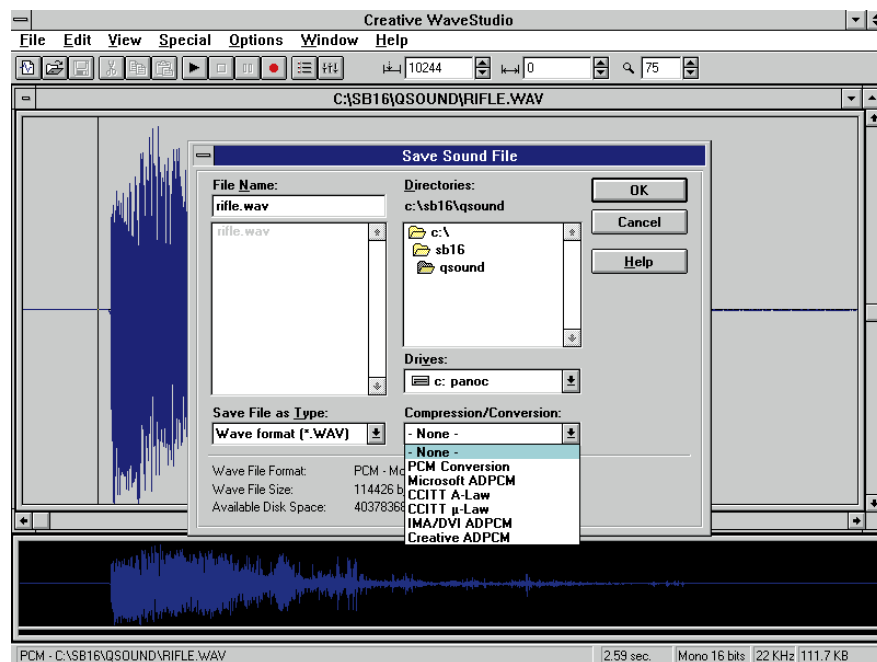
Panicos Georghiades and Gabriel Jacobs explain the pros and cons of today's special AV drives to help you decide whether or not they are worth the extra cost.

This month we dedicate most of our column to an important issue in multimedia production — disk drives. We examine whether there really is a need for the special kind of audio-visual drives now available. But first, a short letter.

Robin Penny writes: *"Thanks for your article on audio compression in the October issue of PCW. Unfortunately, you failed to answer the real question, which is how do you compress WAV files in the first place? I read a lot of mags but have not seen this question answered anywhere. Presumably, as the codecs are in place when you install Video for Windows, you do not need to do anything for decompression to occur. I use a SoundBlaster 16 PnP card but it does not have the ADSP chip. I heard that one is needed to handle compression."*

In Windows 3.1, once you install Video for Windows some of the codecs we mentioned (most importantly, ADPCM) become available to you. With Windows 95, all of them are available on the Win95 CD, but you do have to install them. They're to be found in the multimedia section of the installation procedure.

Files don't compress automatically when you save, simply because you have a card which is capable of compression, so you need to initiate the procedure. The Windows 95 Sound Recorder offers several compression options including all the installed compression drivers when you save a WAV file. Alternatively, you can use other sound-editing software for compression. Creative Labs supplies WaveStudio with most of its sound cards, which gives you additional compression options when you save a file. Unfortunately, the Windows 3.1 Sound Recorder has no



WaveStudio gives you more than one compression option when you save a file

options to compress files so you're forced into using a third-party sound editor that supports compression.

Judging from the fact that you have a plug-and-play card, you must be using Windows 95. If you're into audio editing and find the Windows Sound Recorder a bit limiting, a program we use and find very good is SoundForge 3.0. Generally, an ADSP chip isn't needed for non-realtime compression and decompression. Even for realtime applications, a high-powered machine (anything above a 486/33) can do the job in software. For MPEG sound, you need a higher spec: an ADSP chip can help relieve your machine of some of the necessary work. See next month's instalment on audio compression.

AV hard disks — are they worth it?

A number of hard-disk manufacturers either produce special audio-visual (AV) versions of their drives, or incorporate features which enable them to be termed "audio-visual". That means the drives are especially suited to handling digital audio and video data. Of course, they charge more for these drives: about 15 percent above the price of a normal drive.

The market for this type of drive can be divided into three major groups. At the top end (in terms of requirements) there are companies such as BT and other future broadcasters who wish to provide video-on-demand. They need to store lots of full-length films as well as allowing viewers to download them, thus very high

capacity and performance hard disks are required.

In the middle, there are the video-editing companies, music studios, TV and radio stations and commercial multimedia developers. For these organisations, the capacity of the drives does not need to be quite as high as when providing video-on-demand because much of the editing may have no realtime requirement.

At the bottom, there is the increasing market of home video and music enthusiasts, and producers of multimedia games, presentations and training programs. The capacity and specification requirements are lower due to the fact that home-quality video doesn't need as much storage space as broadcast-quality.

This third category of user has the least money of the three yet most of us ordinary mortals belong to it, so it's for the sake of the majority that we have carried out an experiment to determine what difference AV drives make. Before revealing the results, we should say something about the relevant factors affecting disk drives which are used for audio visual material.

The first factor is capacity. A 500Mb hard disk is adequate to store your disk-hungry Windows 95 (about 75Mb) and still leave you with space for your letters and all that email you may get from the net in the next five years. But a 500Mb hard disk can store less than 20 seconds of broadcast-quality video, or 80 seconds of (VHS-equivalent) home-quality video.

Yes, with compression you can get more, but when you're editing original material you don't want to use too much compression as it degrades the quality. You also need at least as much working space as that taken up by your video material.

The second factor is random access time. Video and audio data accessed in realtime, during simple playback or recording, requires the characteristics of a disk to be that of tape giving an uninterrupted supply of data, but this is made difficult by the requirements of digital editing (the need to jump from place to place). In addition, sound and video data is not always interleaved (stored close together). During editing, it may be in two different files. Also, files may be fragmented on the disk and if you're dealing with many tracks you'll be using many files anyway.

Hard disks nowadays manage about eight to nine millisecond access times, but that's the duration of two frames of video. In

audio terms, eight milliseconds is a long time: it's a sizeable part of a consonant sound in speech, which you'll definitely miss if it's not there; furthermore, in that amount of time, out of the 44,000 units needed for every second of CD audio about 350 units of sound is stored. Missing even one such unit can create abrupt changes in the level, which will come out as clicks and crackles.

The third factor is the rate of data transfer between disk and computer. You need a high sustained transfer rate for audio visual work. You can get ordinary hard disks with high average transfer rates, but this is no good if the rate fluctuates too much. You may have a drive that takes 60 seconds to copy a 60Mb file (average = 60 read + 60 write = 120/60 seconds = 2Mb/sec), but in those 60 seconds the transfer rate may fluctuate between 1Mb/sec and 2Mb/sec.

On the other hand, you may have another drive which takes 90 seconds to copy the same file (average = 60 read + 60 write = 120/90 = 1.5 Mb/sec), but where the transfer rate fluctuates only between 1.4Mb/sec and 1.6 Mb/sec.

The second drive with the lower average transfer rate (but the higher sustained minimum transfer rate of 1.4Mb/sec instead of 1Mb/sec) will be better suited to audio visual work.

The transfer rates of hard disks are presently still quite low and for professional video work, single hard disks are not used. Instead, arrays of hard disks are combined to reach the required figures. For multimedia production and audio and home video editing, some of the latest hard disks are adequate, but the question we finally come to is: is it worth paying the extra for a specialised AV drive?

Micropolis

We asked Micropolis, probably the best known of the hard-disk manufacturers which produce this type of drive, to lend us four of its products for testing purposes.

Micropolis AV drives incorporate a number of features which make them specialised:

- They give a constant data transfer rate by using caching techniques to keep realtime disk housekeeping, and therefore interruptions, to a minimum.

- Soft data errors which, on an ordinary disk, may take a comparatively long time (850 ms) to correct, are corrected in ten milliseconds or less on the fly with the use of a dedicated correction engine which also

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cuts out retries. Retries require a complete revolution of the disk and they are not uncommon on a conventional drive. You do not notice them because everything is happening so fast, but they can nevertheless ruin a smooth audio visual transfer.

■ On many conventional disks, thermal re-calibration, where the drive heads are re-aligned to take into account any changes in temperature, takes place every ten minutes or so. The process is eliminated in the Micropolis AV disks (not just deferred) by the use of a special servo system.

■ De-gaussing (the correction of magnetic orientation) of the data head takes less time than on a conventional disk.

Other AV drives are available from Seagate, Hewlett-Packard, Conner, Quantum and others. Not all achieve their AV capabilities in the same way as those from Micropolis. For example, some concentrate on cutting down time-consuming error-logging, improving error management and thermal re-calibration in ways which are different from the Micropolis methods, configuring disk cacheing, buffering in special ways, and so on.

In the meantime, how did the Micropolis disks perform? Well, we did carry out some benchmark tests for our own satisfaction, but numbers weren't really of interest to us. What we wanted to know was whether there was any noticeable difference between a conventional and an AV drive when grabbing and playing video.

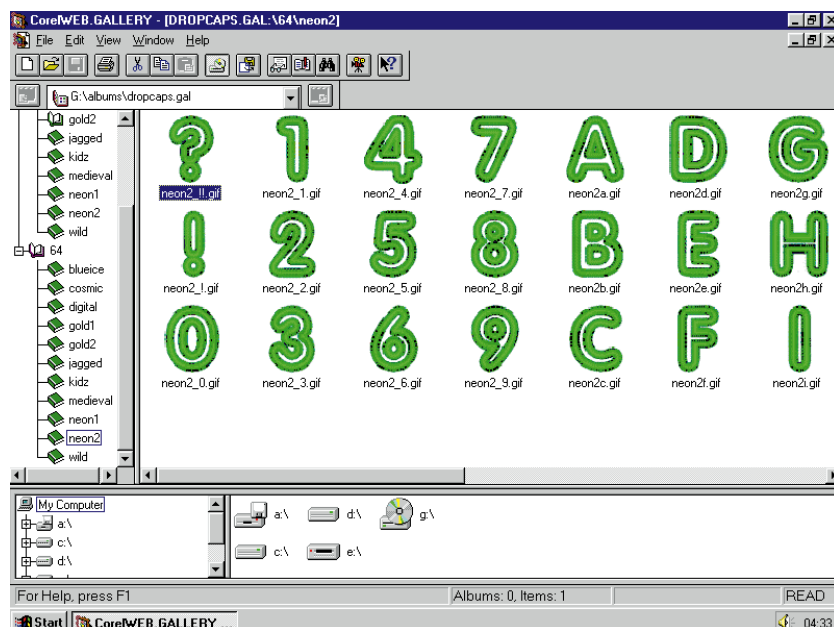
We tested an AV and a standard model from two classes of drive: the 4221 and the 4421. The drives were all internal and we tested them on the same PC using the same SCSI-2 controller and software. Conditions remained the same and we exchanged one disk immediately after another.

In both cases, the difference between the AV and non-AV versions of the drives was not dramatic, but it was noticeable as well as measurable (in lost frames) when dealing with a video clip even as short as 60 seconds. We measured differences of five to ten frames in 1,000.

All drives behaved better in capturing data than in playing it back, and video tended to be jerky on playback even when no frames were reported as missing during capture. This was due to the computer processor being busier at playback. It's also a characteristic we've noticed on other drives from other manufacturers.

During playback, the AV versions of the

CorelWeb.Gallery

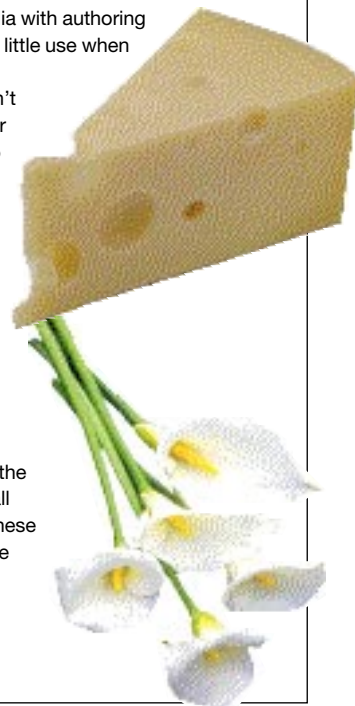


Many manufacturers provide multimedia clip art and clip media with authoring packages and sometimes separately, and quite a lot of it is of little use when you're working on a project that involves original material.

The reasons are usually that the style of the clip art doesn't match what you want, the quality isn't up to what you want, or simply because you want to use something that is different to everyone else's.

A product released recently for the web, called CorelWeb.Gallery, can just as well be used in multimedia development. It contains a substantial selection of goodies,

including arrows, bullets, buttons and dividers. There are also dropcaps, icons, backgrounds, objects, thousands of photos and clip-art images, all organised into 120 themes. We were very impressed, especially with the small file sizes and the small number of colours used in these images, which save space and downloading time. CorelWeb.Gallery costs around £79.



drives gave a perceptibly smoother performance than the non-AV versions. We discovered that the differences in performance between the AV and non-AV versions increased when the RAM in the machine decreased. Not surprising, because less memory means less buffering.

In conclusion, if you're writing CDRs or dealing with multitrack audio or output of edited video onto tape, an AV drive is definitely worthwhile, especially if your machine has less than 32Mb RAM. If your

machine has that amount or more and you're not dealing with realtime playback applications, the difference will certainly be there. You just may not notice it.

•PCW Contacts

If you have any queries, or interesting multimedia-related topics to discuss, we'll be pleased to hear from you. You can contact us at g.c.jacobs@swansea.ac.uk or panicos@diapipex.com
Micropolis 01724 751315
Soho Sound House 0171 379 5148



Pro-creation

Corel has given birth to its latest package, Click & Create. Panicos Georgiades and Gabriel Jacobs take a peek.

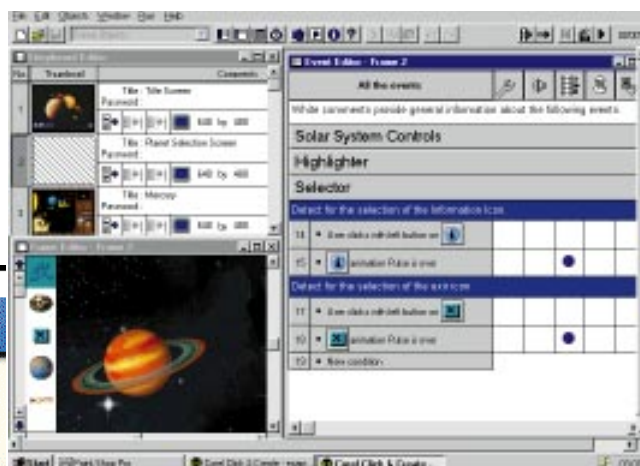
How many multimedia authoring packages can you name? Five? Ten? Twenty? You may be surprised to learn that there are more than 50 for the various platforms but they are not all called authoring packages. Some call themselves presentation packages, while others are full-blown programming languages. A newly-released package from Corel, Click & Create, joins this large and growing group.

Click & Create is sold as a powerful multimedia authoring tool, at a suggested price of £495 (not cheap by any means). Despite being targeted more at developers than home users Click & Create is not, in our opinion, as powerful as Director or Toolbook although we recognise that much

here depends on your particular needs. Anyway, the package does have the Corel badge and offers a number of interesting facilities and resources.

You can use it to develop CD-ROM titles and corporate presentations, although it's wildly overpriced if all you want to use it for

Click & Create: storybook, frame and event editors



is presentations. It can also be used to create screensavers and (very successfully) games.

As for that price tag, Corel is offering a special price of £199 if you want to change from your current authoring system (this is what's generally known in the software business as a "competitive upgrade").

Click & Create works under Windows 3.x and 95/NT. It comes in both 16-bit and 32-bit versions and includes support for DirectX and WinG. A Mac runtime player has been scheduled for release as a free add-on and should be available by the time you read this.

The package includes many features and facilities. There are button, animation, picture and morphing editors. There's ODBC (Open DataBase Connectivity) support and specialised game-editing tools.

Applications can be saved as EXE files (or as screensaver SCR files) and you can distribute your applications free-of-charge, although you need to include the product's logo on your packaging.

The two modes supported are frame mode for slides in a presentation or pages in a book, and timeline mode, as in a movie

where events happen at a specific time. There are editors for these, as well as a storyboard and event editor. This latter is really the powerhouse of the package. You build up events and when they occur you can trigger actions: play video, CD audio and so on. By using the events editor and menus and dialogue boxes, the program does away with the need for a programming language.

The support for media is extensive and equivalent to that found in any package at the top of the range. If you don't have enough of your own media there's Liberia,



A multimedia music title, compiled using Click & Create

consisting of repackaged bits from the clipart that comes with Corel Draw. It's very large and probably better than that offered by any other multimedia package available. There's an extra CD-ROM with 210 fonts, 1,100 images, 250 video/animation files, 1,400 sound effects, 200 transitions and more. The MIDI files were done by our friend Ian Waugh and they're very good. Although 30-days' free technical support is less than you get with other packages, you do not have to pay for the telephone call because it's on a freefone line.

Only time will tell whether or not this product can make a significant dent in the large market shares currently held by Director, Toolbook and their ilk. There's bound to be a shake-out soon — even the potential of the multimedia authoring tool market isn't infinite. We wouldn't dare hazard a guess at who will be the eventual winners.

You can find more details about Click & Create on the internet at <http://www.corel.com/click&create>

Going Dutch or going Greek?

Q. "I live in the Netherlands and bought a six-speed Vertos CD-ROM drive locally. Although it has now broken, it's still under warranty. But I have a big problem because the dealer has gone bankrupt. I've searched (in the Netherlands) for Vertos but it doesn't seem to exist.

Via the internet I have managed to track down Vertos's home page in Greece and

have mailed the company several times, so far with no result. Really, when you buy something in good faith and want to invoke the warranty you should be able to find the company responsible.

I've read in your magazine that Seagate and Sony will repair equipment if a dealer isn't able to. Shouldn't this be standard procedure for all products?"

Guido Schonkeren
[<csg807@wing.rug.nl>](mailto:csg807@wing.rug.nl)

A. We publish your letter because, indirectly, it raises two important issues relating to the current state of multimedia hardware.

The first is that the market forces which cause dealers to go bust are, in the end, very much in favour of the consumer. For some time now we have seen falling prices as competition intensifies. If multimedia is to reach its true potential, this competition must continue and many dealers will go bust in the process (it's a fact of life) but it also means that the survivors will be forced to offer less in the way of after-sales service and that is very worrying.

The second issue is that because prices are falling so consistently and so rapidly, we're almost moving into throw-away multimedia hardware. So it would hardly have been worth sending your CD-ROM drive abroad for repair or replacement. Here in the UK, you can now obtain drives from around £35. You should take into account the fact that when you send equipment away for repair, you will

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Click & Create can be used to author multimedia, games and screensavers

be without it for perhaps several weeks. It gets close to the point where you might well consider throwing it away and buying new.

In your particular situation, however, you haven't extracted the right information from the net: Vertos isn't a Greek company; the Greeks haven't really manufactured anything since the Parthenon!

Vertos CD-ROM drives are made by Elitegroup Computer Systems in Taiwan. We have no Netherlands address but in the UK they're at Unit 10, Victory Business Centre, Worton Road, Isleworth TW7 6DB (telephone +44 181 847 3332). If you contact the company, giving the serial number of your drive, it should be able to tell you where to get it repaired or replaced.

Perhaps it's about time we had a European Consumer Protection body?

Making Movies

Q. "I am keen to try video editing on my PC: nothing professional, just VHS film of my family growing up, our holidays and so on. I want to transfer the video from my camcorder to my PC, edit it, inserting titles and transition effects and then dump it onto VHS tape as a finished product.

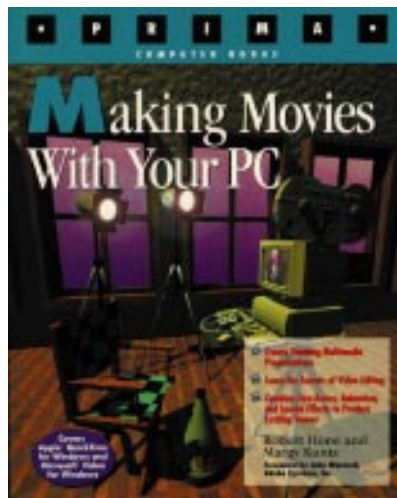
I have only seen one advertisement for a complete package, the FAST Electronics F60, which includes hardware and software. However, I am reluctant to commit myself before knowing firstly, whether there are other ready-made solutions and secondly, whether I couldn't construct a purpose-built set-up using a multimedia card and separate software. Many of the multimedia cards I have seen advertised seem to support video capture but not transfer to tape. Any suggestions?"

David Challes

<101713.2007@compuserve.com>

A. We receive many queries on this subject. Yes, you're right: you do need to get a card that supports video output as well as input. But the F60 is not your only option.

Miro DC1, DC20, Reveal VE500P and the new Diamond Crunch It 2000 (as well as others) have video output and are bundled with video-editing software (mostly Adobe Premiere LE or Ulead Media Studio). Some of these cards start at just over £350. There's not really a lot of difference between them and most use the same types of chip. The Reveal VE500P (also named Video Artist), offers a complete package including a book, called *Making Movies with your PC* (ISBN 1-55958-389-4).



However, it's important to take a number of other things into consideration. You need a good hard disk with lots of space and a high and constant transfer rate, especially since you'll be playing back to record the result to video. A transfer rate of over 2Mb/sec (actual figures, not manufacturer's specifications, so take care) is required for a good recording with no deterioration. For VHS quality you can capture at 352 x 288 pixels at 25fps compressed at 4:1.

For this level of performance, an audio-visual drive would be preferable. It gives smoother capture and playback. Two Gigabyte drives can now be had for just under £400. (See next month's column for more on audio-visual hard disks).

If you have a machine that has a PCI motherboard, you will achieve better results (i.e. you'll capture more data per second) with a PCI capture card, as opposed to an ISA card.

Fungus Illuminatus

Q. "I tried to use the *Illuminatus* demo on the PCW CD-ROM, but it won't run because it wants CTL3D.DLL. Where I can get this?

Secondly, do you think we might ever see a review of expert systems in PCW? Perhaps this is too specialised but I would like to produce an illustrated guide to species identification for a group of fungi. It looks as though *Illuminatus* might be suitable and quite inexpensive. I want to do run-time versions but not allow people to readily copy my information.

It has been suggested to me that you can do just about everything you need to with a Windows help file (although I'd imagine there's not much security). I am not a programmer. Indeed, my attempts at

programming in the past have been most unsuccessful!"

Christopher Walker

<walker@globalnet.co.uk>

A. In answer to the first part of your question, CTL3D.DLL can be found on the PCW cover-mounted CD-ROM in the directory which holds the Video for Windows 1.1e files. You can copy it to your Windows\System directory and decompress it using:

```
Expand CTL3D.DL_ CTL3D.DLL
```

Better still, just install Video for Windows which you need to do anyway to run the video files on our CD-ROM.

Expert systems are not our speciality, so we'll pass on your request to our features editor. But with respect to your illustrated guide to fungi, *Illuminatus* is a simple program to use and doesn't require a distribution licence. It's cheap, and most of your data gets embedded in the application so it's not easy to copy. But do bear in mind that no information is safe once it's in electronic form: however much you encode it, once it's on the screen, all someone has to do is press the Print Screen key and it's copied to the Windows clipboard.

The other point to consider is whether you want a text-search facility and how much data your application will hold. If you're dealing with many hundreds of species, a Windows database program (Access, Paradox, dBase, or Approach) may do the job better and more easily than a multimedia authoring tool. With the coming of multimedia authoring tools, database programs seem to have suffered something of a decline (in these types of applications), which is a pity because very often they're exactly what you need.

We assume, in suggesting this, that you have only text and pictures — no video or sound. We also assume that you'll have no hotwords that link to other topics and no pictures with hotspots that lead to other pictures or text. Authoring tools such as *Illuminatus* and other multimedia authoring software are built specifically to take account of such things.

PCW Contacts

If you have any queries, or interesting multimedia-related topics to discuss, we'll be pleased to hear from you. You can contact us at:

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or **panicos@dial.pipex.com**

Corel 01703 814142



Battle of the bulge

Audio is an insatiable glutton for storage space. Panicos Georgiades and Gabriel Jacobs recommend putting it on a diet using audio compression.

Audio is important to multimedia, partly because it has a quality which few visual effects possess, especially when presented on a busy screen. It can really grab your attention. Used at the right time and in the right form, the audio element of multimedia can be very effective indeed.

However, one of the problems of using audio is that it takes up a lot of storage space. It's the second most storage-hungry medium after video. And compression, often used with still images (GIF and JPG files) and always used with digital video in multimedia (Cinepak, Indeo, MPEG) hasn't seen such a wide use in audio.

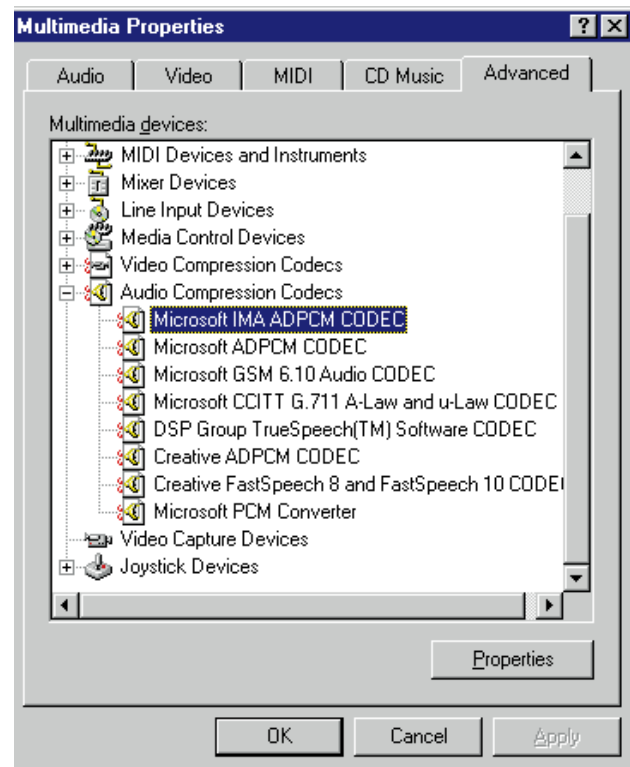
For years we've had to suffer 11kHz 8-bit mono (so called AM-quality sound). We seem to have moved to 22kHz 8-bit stereo for multimedia on CD-ROM, but the internet is forcing a backward step with its 8Kb telephone-quality sound. With multimedia on CD-ROM, however, it's possible to enjoy CD-quality sound and use the same amount of storage space as 22kHz 8-bit sound, with compression. And any machine that can play Video for Windows, can handle it.

Part of the reason for the lack of audio compression in the early days was the use of 386 machines and basic sound cards, but the hardware situation has changed. Most users now have at least a 486, capable of audio decompression in realtime. Compression and decompression drivers have been available for free, and are

installed automatically with Video for Windows. They come as standard with Windows 95.

With Windows 95 you get ADPCM, TrueSpeech, GSM 6.10 audio and CCITT G.711 (A-Law and u-Law).

With Windows 3.1 you don't get any of these, but you do have the possibility of adding audio codecs (a CODEC is a



The Video for Windows runtime module includes Microsoft and IMA ADPCM

COmpressor/DECompressor) and the Video for Windows runtime module includes Microsoft and IMA ADPCM. Individual sound cards may add their own.

Compression expression

What are these things and what do they do? ADPCM (Adaptive Delta Pulse Code Modulation) comes in two flavours: IMA and Microsoft. Other companies, such as Creative Labs, have their own variations.

IMA stands for Interactive Multimedia Association. The definition is for multiple hardware platforms and is real-time compression.

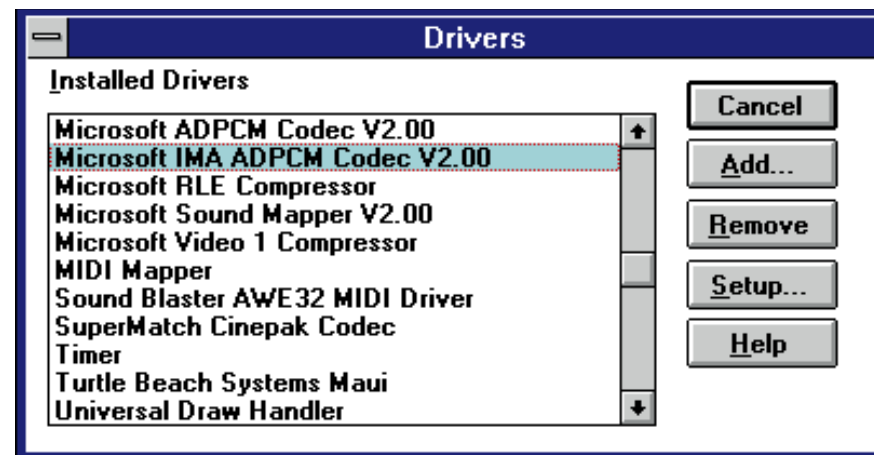
Microsoft ADPCM is similar, but offers both real-time and non real-time compression. Non real-time compression using this method can create better-sounding audio files.

This codec is what's used in Microsoft's Encarta encyclopedia. It compresses at 4:1, and works by storing the differences between two subsequent samples rather than the value of each sample — a smaller number which can be stored in four bits instead of 16.

Although low frequencies are fairly faithfully reproduced, high frequencies can sometimes become distorted. You can hear the distortion quite plainly when the sampling rate is 11kHz, and it decreases

with higher sampling rates. At 44.1kHz, you can't hear it at all if you have normal hearing. Thus, at high sampling rates, it can be used successfully for classical music, solo instruments, and good-quality speech.

CCITT G.711 A-Law and u-Law are codecs which give compatibility between telephony standards in Europe and North America. CCITT stands for Consultative Committee for International Telephone and Telegraph: it's an international organisation which creates and approves communications protocols. Its G.711 codec offers a 2:1



Audio compression drivers that come with Windows 95

compression ratio by moving from 16 bits to 8 bits per sample. We don't recommend using it for multimedia.

TrueSpeech has been developed by the DSP Group. It offers good compression (about 16:1) and is fine for certain voice applications, but it's not a good option for music, as you'll hear in our example on the CD-ROM. It doesn't give you real-time compression, but it does offer real-time decompression and is a viable alternative for use with modems and networks. It can certainly be used in multimedia for narration if you have too much sound and too little space.

GSM 6.10 is a good real-time compression system, if your hardware is fast enough to handle it. It's a useful codec for recording voice with the Windows Sound Recorder when you want to store sound embedded in documents, and it conforms with a standard set down by ETSI (the European Telecommunications Standards Institute).

For now, we'll leave you with these brief explanations and will return to the subject in more detail at a later date. Meanwhile, we've included various versions of an audio sample on this month's cover-mounted CD-ROM, which has been compressed using these methods, so do have a listen to it.

Not a clear picture

Another reader has sent us an interesting query to which there is no clear answer: "Much interest is being shown in electronic still-image cameras at present. I have seen the advertisements concerning inexpensive video capture cards but I've heard that they only work for a composite signal and not for the higher-quality S-Video signal, although this may be incorrect.

"Could you please advise how an S-

Video source can be used with its higher resolution as a source for putting video clips onto the hard disk? More importantly for me, please explain the process for still electronic images. I would then try to print them at 720dpi onto special paper on an Epson Stylus Color.

"I think an answer to this question, including a comparison of the degree of resolution obtainable from an S-Video signal, vis-a-vis that obtainable from the new electronic image cameras, would be of interest to many. It might even stop the mythical estate agent rushing out to buy the new cameras if he already has a Hi-8 video camera."

James Jenkin
<jenkin@itl.net>

You're right about being wrong in what you've heard about the S-Video capabilities of capture boards. Ninety-nine percent of video capture boards on the market include an S-Video input. Also, most of them can capture stills (or single frames) and move video. So yes, as you have deduced, it's possible to get very good results from using a video camera and a capture board. However, before dismissing the usefulness of still digital cameras, there are a number of things to consider.

Most capture boards nowadays, costing £300 to £1,000, will capture a full PAL signal (most of the visible horizontal lines). The information in each line is normally digitised up to 736 times, usually using Y:U:V 4:2:2. This results in a 24-bit true colour picture. So you can end up with a captured photo-realistic image which is 736 wide x 560 high.

However, this comes from the power of the capture board and doesn't depend on whether or not you connect the camera to it

using S-Video or composite video.

Most domestic camcorders have an estimated horizontal resolution of about 500 lines on a live signal, but still compare well with the resolution of some of the cheaper cameras working at up to 400 lines only. But when you record a camcorder signal onto tape and then play back and capture, the recording process puts on its own limitation of an estimated 400 lines (for Hi-8, S-VHS, or S-VHSC).

You also have tape-related deterioration like drop-out, noise and colour changes. In addition, the PAL signal from a camcorder is interlaced — the odd lines are not drawn at the same time as the even lines. This creates further problems often visible on stills captured while the subject is moving. Digital cameras, on the other hand, have low shutter speeds (the Casio QV10 can go as low as 1/4000 of a second). There can be synchronisation problems between the camcorder (playing a tape) and the capture board.

These are the disadvantages of using a camcorder plus capture board combination. But there are advantages. For example, the lenses and zoom facilities on most camcorders are better than those you find on cheaper digital cameras. A video tape can hold many more images than any digital-camera's floppy disk or RAM. And if you're capturing things in motion, you don't have problems with people shutting their eyes just when you click.

The main advantage of digital cameras over capture boards is not in their resolution.

Fig 1

Casio QV10	320 x 240	96 images in 2Mb RAM
Kodak DC20	493 x 373	8 images in 1Mb RAM
	320 x 240	16 images in 1Mb RAM

You can see that these resolutions are similar to those of camcorders.

It's true that the expensive ones (£8,000-plus) can go to high resolutions, some comparable to film. But the cheaper ones (£400 to £1,000) don't have high resolutions. The table in Fig 1 illustrates the point.

Where digital cameras differ is that the signal has a shorter path (thus less processing) and is therefore truer. A signal that simply gets digitised and stored to a disk or RAM is likely to be truer to the original than one which gets converted to

The Sony PRD-250, an external, portable CD-ROM drive which doubles-up as an audio CD player



S-Video, then to a magnetic field from an analogue electric signal, then back to S-Video, and is then digitised by the capture board within a noisy PC environment.

As a result, images from digital cameras tend to have less spillage of colour from one pixel to another, and less noise. They give a clearer image, even if the resolution is less than that which you may get with a camcorder.

If you can avoid recording a signal onto tape when using a video camera and capture board, and you can capture from a live signal, the results obtained can be comparable, and even sometimes better than, what you can get with a cheap digital camera. This is fine, but now you have lost the portability aspect. You can now see why there's no straight answer to your question.

It's worth mentioning that the lighting on the object you're digitising will play a far greater role in the quality of the results than whether you use a digital camera or a capture board, or whether you use S-Video or composite video connections. Note also that the situation is likely to change, in favour of the camcorder and capture board combination, with the new digital camcorders now becoming available.

CD-ROM drives and hi-fi

Reader, Lawrence Lo, writes to ask whether he can use one of his CD-ROM drives as an audio CD player. "I have three CD-ROM

drives: a double, a quad and an eight-speed. I want to take out the double-speed drive, which is a Creative Labs CDR-563. I was wondering whether it is possible to use it as an audio CD player for the hi-fi? I'm sure many other people have, like me, upgraded their CD-ROM drives. Some may still even have their old single-speed drives. Can they be used for audio?"

Lawrence Lo

<lawrence@fusionuk.demon.co.uk>

You're not the first to have this idea, Lawrence. In fact, it's the most obvious use for an old CD-ROM drive. However, unless you have an old computer (even an 8086 with only 640Kb RAM, no hard disk, running under DOS) and an appropriate interface card (an old 8-bit SoundBlaster with a CD-ROM interface will do), you can't do it with your particular drive. This is because even though you can connect its audio output to your hi-fi, and maybe even power it externally, you'll have no control over its transport mechanism.

This is not the case with all CD-ROM drives. Some external drives, especially most of the portable ones like the new Sony PRD-250, are designed to double-up as CD players.

•PCW Contacts

If you have any multimedia-related problems, queries, hints, tips, or suggestions, write to us c/o PCW at the usual address, or email **g.c.jacobs@swansea.ac.uk**



Sounds good!

The sound of silence? No way: CD-ROMs are available with sound effects for every occasion. Panicos Georgiades and Gabriel Jacobs tune in.

We get mail from time to time asking about sound effects and media clip-art for use in multimedia applications.

Here's a typical message: "I'm looking for a collection of traditional sound effects like footsteps, doors opening, thunder and so on. Preferably, I want them in Macintosh format and royalty-free so that I can include them in Director movies. Do you have any idea where I could find such a product?"

Gordon Cowtan
(gordon@cowtan.demon.co.uk)

There are many CDs with sound effects in ordinary CD-audio format, but the best collection, in our view, comes from the BBC. The catalogue for internal BBC use spans over 100 CDs, and 40 of these are available at £29.99 each. There is also a cut-down, amateur collection of 12 CDs which cost £12.99 each. The Hollywood Edge catalogue from the USA is worth having, too. It's sold in the UK by a number of professional audio distributors, and there are about a dozen or more sound effects catalogues for use in music and film production.

For multimedia, there's less choice (of good quality material, anyway). You'll find far more in Windows (WAV) format than in Mac (AIF) format. More come from the USA than from the UK, which will make a difference if there's speech in the environments you're after. A typical media-clip CD-ROM is Moon Valley's



Global SFX is part of the Creative Essentials series and offers high-quality sound effects

News in brief...

- Asymetrix has just launched a special version of ToolBook for the Internet, called ToolBook II. It's said to deliver distributed learning applications in HTML and Java.
- Macromedia will shortly be releasing a toolkit for creating CD Plus using Director 5. Sounds interesting...
- Adobe Premiere 4.2 for Windows is now on sale, as are GLPro for Windows (the Windows version of the Grasp programming language), and Authorware 3.5.

ROM Material Again (£19.95). It contains video-clips, stills, animated icons and, of course, sounds. Most sounds are available in all the formats from 8-bit, 11kHz mono to 16-bit, 22kHz stereo. The sounds cover a selection of machinery, animals, nature environments and spoken words in American English, UK English and English with French accents.

This CD-ROM is targeted at end-users who want to use it to enrich their desktops rather than for multimedia purposes. You'll find many similar CD-ROMs, and the sounds are really quite usable.

CD-ROMs specifically meant for multimedia are more rare, although they are beginning to appear in greater numbers. One example is a new CD-ROM release from the UK called Global SFX (£19.95) which has samples of a much higher quality than standard clip-art-type sound effects. In fact, it's the best you can hope for at the moment. It's part of a 30-volume series called Creative Essentials released by Time+Space.

The series has a dual use: multimedia, and sampling for music applications.

This is why most of the titles in the series have a musical instrument sound content. Volume 10, which we can recommend because of the quality of the recordings, contains sound effects. The sounds have been recorded in three formats: CD audio, Windows and Mac, and in 16-bit 44.1kHz stereo.

There are 26 tracks, with about 200 individual sounds. Here is a sample of the types of sound effects covered:

● Video and cassette machines, static, cameras, beeps, phone-related sounds, alarm, hammer, WC, typing, door-related sounds, stapler, spray-can, hair-dryer, kitchen sounds, lawn mowers, trimmers, water, percussion, zoo, café, swimming pool, market, public park, launderette,



The Multimedia and CD-ROM Directory is an up-to-date guide with worldwide coverage

sirens, airport sounds, railway station, various motoring sounds, ducks, flies, laughter, burping, footsteps, drinking, and a 1kHz tone for setting up your equipment.

One word of warning, however: with some of the CD/CD-ROM collections, you're free to use the sounds in your distributed applications. With others, you're only free to distribute the applications containing them, within your own organisation. In no case are you allowed to repackage and sell the sounds.

The Creative Essentials sound effects mentioned above are royalty free, so they're fine for you, but you must read the small print carefully.

The CD-ROM and Multimedia Directory

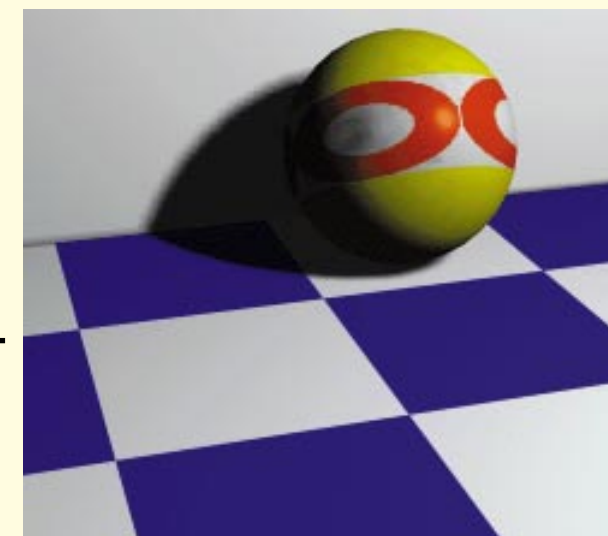
We've recently had the chance to browse through this year's Multimedia and CD-ROM Directory (on CD-ROM). It combines two paper publications: the CD-ROM Directory 96 (15th edition) and the Multimedia Yearbook (5th edition). It may be useful if you're looking for companies

that develop, or are otherwise involved in, multimedia and related hardware and software, even multimedia titles.

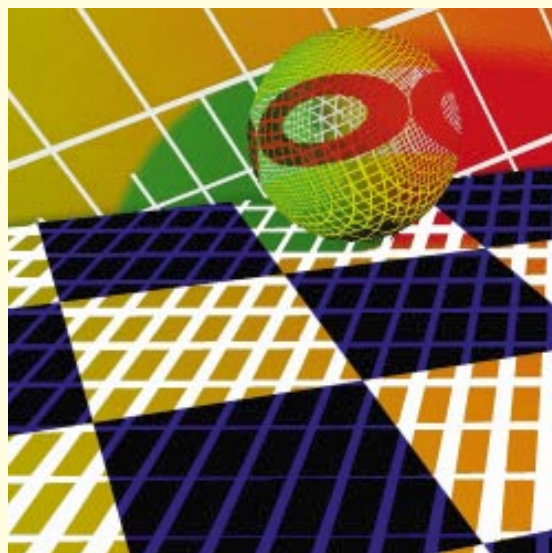
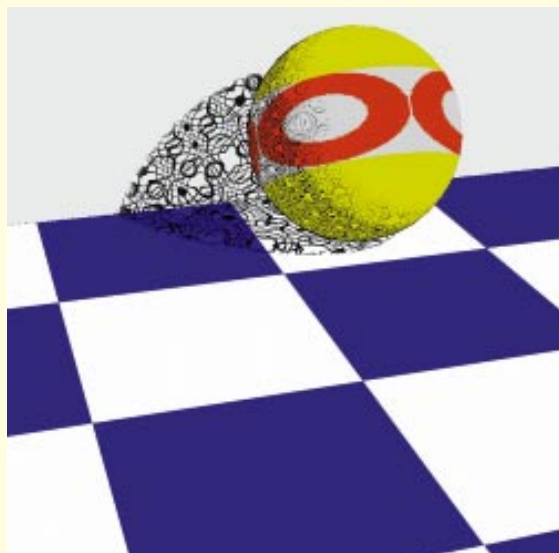
The publications have a worldwide coverage (there are about 1,400 multimedia-related companies in the UK alone) and they have a multi-lingual user interface for menus and help screens (English, French, German, Spanish and Italian).

The CD-ROM is divided into a number of sections including companies, titles, hardware/software, books, journals, conferences, and a glossary. There's a search engine, of course, and you can copy and print what you find.

The problem with material on CD-ROM today is that it can easily become dated, especially in an area as volatile as multimedia, even if the CD-ROM is updated every six months. We were pleasantly



An example of photorealistic rendering (more are shown, overleaf)



The two illustrations here show the kind of rendering that Artificial Drawing can perform. There are more examples on our cover-mounted CD-ROM this month

surprised to find included some recent versions of products, showing that it's about as up-to-date as possible. The importance of any directory of this kind is that it provides a good starting point, and this one certainly does.

● *The CD-ROM Directory 1996 (ISBN 0-333-662-55-5) and The Multimedia Yearbook 1996 (ISBN 0-333-662-56-3) cost £135 each. The CD-ROM version (which includes both) is a bargain at £175 and is published by TFPL.*

Artificially yours

Computer graphics have been around for a very long time. From their beginnings in the early sixties, with Ivan Sutherland at MIT, they have grown into a billion-dollar industry which has even arrived in Hollywood, as in the latest Disney blockbuster film, *Toy Story*.

Animations of the kind used in *Toy Story* are based on 3D models (wireframes) which are then rendered into photorealistic pictures by applying textures to surfaces, lighting and camera effects. These impressive animations are all produced in the same way. The computer always emulates a camera so it's difficult to create a personal style, and we all know how important this is in making an impact.

On the other hand, paint packages like Fractal Design's *Painter*, which emulate natural media, enable you to create works which are both expressive and creative. Recently, these packages have been able to import video clips and animations to which artistic effects can be applied. But these are applied to a 2D image.

The computer has no knowledge of the content in the picture. People, trees, and houses are all just screens full of pixels. So, although you can create artistic effects, it's difficult to make them realistic. For exam-

ple, the texture on a plane flying into the distance will not change gradually, so the flexibility that 3D animation offers is lost.

It would be nice to have the best of both worlds: a 3D animation system that also draws in the expressive styles allowed by 2D painting systems. A new technology called Artificial Drawing, developed by computer scientist Peter Hall, does exactly that. It allows animators to render animation frames from 3D models in a variety of expressive styles.

Artificial Drawing works by painting lines, dots, and other marks on the surfaces of 3D models in a scene. It paints more of these marks where a model looks dark and fewer marks where it looks light. When the scene is rendered, the marks made by Artificial Drawing are rendered, too. All the shadows in the picture now show up as marks, and this gives the picture its "painterly" feel.

Making a scene

To understand the difference between photorealistic rendering, painting systems, and Artificial Drawing, think of a sculptor who makes models, arranges them into a scene and then lights that scene. If the sculptor takes a photograph of the scene, that's like photorealistic rendering. If the sculptor paints over the photograph, that's like passing an animation/video through a painting program and adding effects. But if the sculptor paints the models and then takes a photo, that's like Artificial Drawing.

In this technique, the marks are more than just dots or lines: they're intelligent

textures, which is why they change depending on whether a model looks dark or light. Textures used in most rendering programs are applied to objects, but don't adapt themselves in this way.

The marks can be set up to look like ink, pastel, or paint to reflect photorealistic light, to create holes in models and to draw things like fur, and they can even move, to animate the sea.

A computer animator is able to choose Artificial Drawing marks from a preset library. New marks can also be created and stored. Different marks can be applied to different objects in a scene, and many marks can be applied to each model. Once each object has all its intelligent textures associated with it, the animation is then automatically created (even though the animator sees no operational difference).

For those in the know, Artificial Drawing is designed to fit into the standard rendering pipeline: it could be a part of any standard renderer, with no significant change to the rendering software.

If you're impressed with the stills and animations created using Artificial Drawing on this month's cover-mounted CD-ROM and you would like more technical information, contact Peter Hall (*see below*). ■

PCW Contacts

If you have any multimedia-related problems, queries, hints, tips, or suggestions, write to us c/o PCW at the usual address, or email:

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Peter Hall peter.hall@cs.cf.ac.uk; web site <http://www.cs.cf.ac.uk/user/peter.hall>

Macmillan General Books

0171 881 8000

Time+Space 01442 870681



Incompatibility blues

Panicos Georghiades and Gabriel Jacobs deal with readers' problems with multimedia compatibility and review Corel's latest CD writing software.

Following your recent article on the new Enhanced CD (PCW, February), I thought you might be interested in my experience of this format.

I was given the Rolling Stones CD, 'Stripped', as a present which is sold as including 'bonus video and interactive material for most multimedia computers'.

I wanted the CD for its music rather than its multimedia features, but I was nevertheless extremely disappointed when I tried to run the software and found that my PC would not even recognise the CD.

My system is a PC with a 486DX2/66 processor, 8Mb free RAM, 1,024 x 768 display in 256 colours, a quad-speed CD-ROM drive (NEC 4xIDE: your Editor's Choice in 1995), Windows 3.1, Sound-Blaster 16 Value sound card and Quick-Time for Windows 2.02. The small print supplied with the CD claims it may not work with some NEC CD-ROM drives, so I decided to investigate.

The Rolling Stones have a Web site at <http://www.vmg.co.uk/stripped>. Their FAQ section gives a long list of incompatible CD drives, or those reported to have problems. Seven models from various manufacturers are not compatible, and 17 out of 46 had problems. The list includes drives from Aztech, Sony, Sanyo, Philips, TEAC, NEC, Creative Labs, JVC, every manufacturer you can think of.

We're told that many of these companies make CD-ROM drives for other computer manufacturers who may put their own brand names on them. So it's possible that we may have one of these drives and not know it.

Symptoms of an incompatible CD-ROM drive are: that only the audio files are

recognised; or that no files are recognised at all; or that the CD itself is not recognised; or that Windows 95 interprets the CD as being an ordinary audio CD and insists on playing it.

The literature states that this is a problem with the technology used to make the CD-ROM (I-TRAX) — not the particular CD-ROM. But that is not much help.

I feel it is important that your readers should be aware of these problems before they rush out to buy Enhanced CDs. When reviewing Enhanced CDs in future, could you detail the flavour of technology used and any known incompatibilities?"

Simon Smith

Simon, your letter raises the important issue of incompatibility, which arises from the fact that digital technology continues to move at a faster rate than the industry can cope with.

There is no satisfactory solution for the user, as something better is always just about to be released. When you've finally decided to buy something, you find that it's no longer the standard.

If anything, the situation is getting worse and Enhanced CD is a classic example. You can always tell if the industry is getting itself into a mess when the acronyms proliferate: especially when some of them mean the same thing —

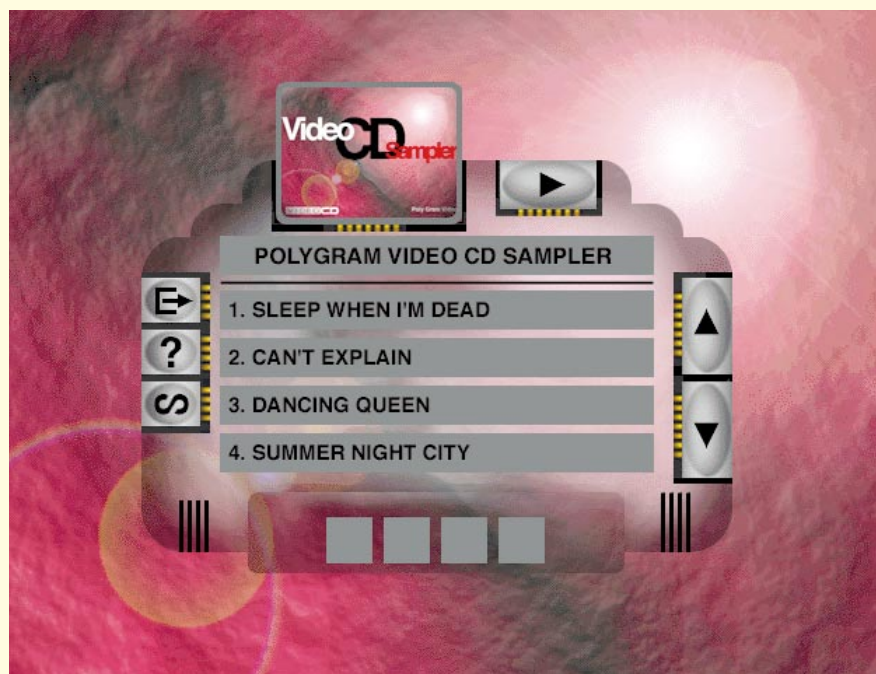


Fig 1 Some Video CDs may have a set-up program which brings up a directory and accesses the tracks

CD Plus, Enhanced CD, CD-Extra, CDX... Where will it end?

Video CD data

"I have a Pentium and a White Book compatible CD-ROM, plus a software MPEG player. I would like to know if an off-the-shelf Video CD would work using any software MPEG player. In other words, if you do a DIR on the CD-ROM, does it give you a file like, say, silent.mpg, or do you need special additional hardware to interpret the format of the CD? Finally, is a CD-i movie the same?"

Karl Chandler

Usually, Video CD discs include a directory which contains a file with the data (the extension is .dat), and additional directories and files which include data and programs for playing that data on various machines (PC, VCD, CD-i). This additional data normally contains lists of tracks, and even bitmap images of VCR-type controls used to play the CD.

Some Video CDs (such as the Polygram one in Fig 1) may include a set-up program which installs an icon in Windows, brings up a directory and accesses the tracks.

Not all MPEG playback software is the same but in theory all should be able to play back MPEG files (extensions may be .mpg, .mpv or .vbs).

So the answer is yes, you should be able to play back Video CD video data using a software MPEG player (or the Windows Media Player if your MPEG player has MCI drivers). But it may not be possible with just any software MPEG player.

A CD-i movie is an MPEG movie, a slightly different format from White Book MPEG, used on a Video CD. But a CD-i disc is not the same as a Video CD disc. There are discs which will work in three different machines, but there's no guarantee that you'll be able to play a CD-i version in a PC without some special hardware, despite what Philips may say.

Video CD is described in detail in the White Book specification, which defines the standard for video compression, ISO IEC 11172, better known as MPEG-1. This allows you to get more than an hour of compressed video on a CD-ROM. The audio is compressed too, and is hi-fi standard. The whole point of Video CD is cross-platform compatibility. Certain Video CDs are produced with the idea of getting the most out of particular platforms, but the video should, in theory, work on any of them if they are suitably equipped: PCs, Macs, dedicated Video CD players, and CD-i systems.

Corel CD Creator 2.0

Earlier this year, Corel released version 2 of its CD writing software. Last year, it broke the price barrier of such software by bringing out CD Creator at £169. Competitive products used to sell at between £500 and £2,500.

However, although the price of CD writers has dropped by half in the last year (from about £1,400 to about £700 or less), CD blanks have not. They're still about £5, and that's when you should buy in bulk as they're about £10 if you buy one at a time.

CD Creator 2 now includes 32-bit applications, as well as the excellent Xing CD, and has other enhancements, too. For example, it can write two new CD formats: Video CD and Enhanced CD.

For Video CD, after selecting video clips and stills, you simply designate the menu structure and away you go. Video clips need to be in MPEG-1 format but if you can only capture AVI (Video for Windows) files you can convert them to MPEG-1 with the bundled Xing CD MPEG encoding program.

Enhanced CD was previously known as CD Plus but is now usually known as CD Extra. It's a new mixed-mode CD format for putting Red Book audio (standard CD audio) and computer data on the same CD. This new standard is known as Blue Book — we'll run out of colours soon.

So far, computer data has had to go as track 1 on the disc, and this has presented problems when the disc is played on some CD players (see Simon Smith's letter, opposite). Under the new format, an ordinary CD player only "sees" the audio data, not the computer data, while a computer sees both. CD Creator also writes MS-DOS, ISO-9660 (Levels 1 and 2), and multi-session discs including Photo CDs, and it supports the new Windows 95 Microsoft Joliet filename system.

In addition, it can write standard audio discs from .WAV files or audio tracks from a CD, which it can get at digitally via your CD-ROM drive. And there's a new 32-bit utility for editing .WAV files which offers ten digital processing effects (including the removal of clicks).

The software includes many useful tools for duplicating CDs and creating CD packaging. For instance, a jewel-case editor helps you design and print transfers and inserts, and "talks" to a number of graphics programs, including Corel Draw 6. If you have the right kind of printers, you can also print onto CD blanks.

It is not at all hard to use. You just drag and drop whatever you're doing. Highly recommended.

It costs £169 (plus VAT).



Fig 2 Corel CD Creator can now make video CDs

A PC or Mac must have a CD-ROM/XA (eXtended Architecture) drive and an MPEG-1 decoder in hardware or software. A dedicated Video CD player is designed to play only Video CDs. It therefore offers less flexibility and less possibility of interactivity, than is possible with a computer.

To play Video CDs, a CD-i player must

be equipped with a DV (digital video) extension, which Philips supplies as a plug-in cartridge. CD-i Video CD supports up to 32 audio channels, as opposed to two on a PC or Mac, and thus allows for multi-lingual versions of titles.

So in direct answer to your question, whether or not you'll be able to access the

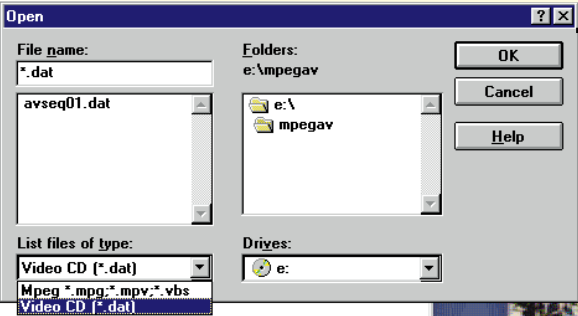
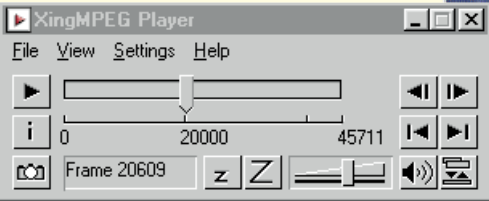


Fig 3 Xing MPEG Player; the best-known software MPEG player on the market



tracks list of a Video CD is not clear-cut: not every software-based, or even hardware-based, MPEG player can do it. Most of the early MPEG software we have come across is designed to play back MPEG files rather than access Video CDs, or CD-i discs — we're back to compatibility, standards, norms, clouds of acronyms.

MPEG software

"I have a Packard Bell 450+ with Pentium 83MHz overdrive, 16Mb RAM, a 1Gb hard disk, Cirrus Logic graphics, a double speed CD-ROM and a Packard Bell Sound 16A card. I was wondering if I could play back MPEG Video CD using MPEG software. If so, where can I get hold of the software?"

Jason Masters

We frequently receive letters about how to play MPEG movies. It shows just how much MPEG video material is out there.

The best software-only playback program we have seen is Xing CD MPEG Player (version 1.3, but there is an update), which works even on a 486/66 under Windows 95. It manages six frames per second (fps) at full screen, and 11fps at quarter screen, also decoding 11KHz stereo sound. The program is designed to run on a Pentium 90 and above and offers good full-screen results.

It also installs a virtual MCI driver which enables you to play MPEG files via the Media Player and other programs that use MCI. Unfortunately, we haven't seen any advertisements for it in the UK. MPEG playback software usually comes free with an increasing number of graphics cards. It may be helpful to contact Graphics Direct

or Xing Technology (see our Contacts panel, below). You can also download free MPEG players from various sites on the Internet.

An appropriate driver

"I have an MPEG card and can play Video CDs fine from DOS, but I can only play MPEG files in Windows95 — not Video CDs. Following some experimentation, I deduced that my CD drive is obviously capable of running Video CDs, and that my Win95 driver is not. I have a Sony CDU76E-Q with a Compaq Presario CDS 772. Can you tell me where I can get an appropriate driver?"

Dermot Kehoe

You should call Sony Computer Peripherals (see our Contacts panel). The problem may also arise from other factors such as your MPEG playback card drivers.

PCW Contacts

If you have any multimedia-related problems or queries, email us at g.c.jacobs@swansea.ac.uk. We're sorry, but we can't answer queries by personal reply — we'd be at it all day! But we're glad to publish your queries, with our answers, which we think will interest PCW readers generally.

Corel 01703 814142
Graphics Direct 01635 873000
Xing Technology 001 805 4730145
Sony Computer Peripherals 01932 816000



Mad March gets our men in a muddle

Oops! Panicos Georgiades and Gabriel Jacobs have been the hapless victims of the great banana-skin bug... On a brighter note, Panasonic pitches in to help developers, and a new Director gets ready for action.

March wasn't too good a month for us in terms of accuracy! A number of people working in higher education emailed us about our section in the March *Multimedia* column entitled "When it comes to the Crunch". Our fault: the email address of the Association for Learning Technology in Oxford should have read: alt@vax.ox.ac.uk

We also apologise if (on page 297 of the March issue) we gave the impression that a single 4Gb hard disk costs £400.

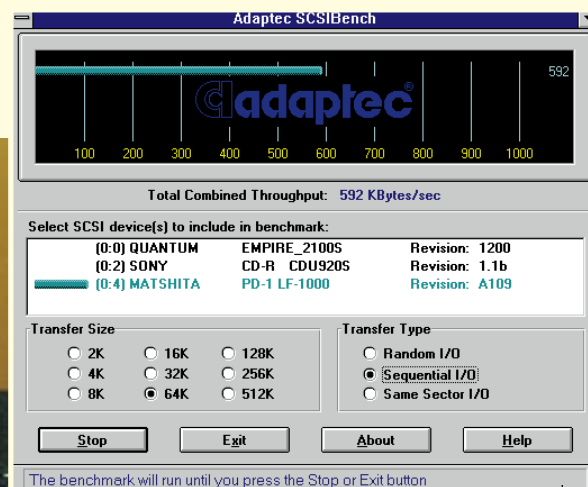
Two readers, A.J Elliott <100112.2612@compuserve.com> and Sumeet Kapur — dbae005 <dbae005@uce.ac.uk> — have been asking where they can get one?

Well, the fact of the matter is that the cheapest price for a single 4Gb drive is around £650. What we really wanted to say was that you can obtain 4Gb of hard-disk space for about £400, and what we had in mind was the new Iomega Jaz 1Gb removable drives. Cartridges have been advertised at less than £100. A similar drive from Syquest claims a transfer rate of 4Mb/sec — good enough for video work.

Note that you can also obtain the Seagate 2.1Gb ST32140A drive for about £240. We can't name specific suppliers — so look in the advertisement section.

A drive for multimedia developers

The same theme — cheaper storage — brings us to the Panasonic PD optical drive. With the recent cuts in the price of this drive (you can get an internal version for as little as £350 plus VAT), this has now become a pretty big temptation for multimedia developers who generally require more disk storage and higher performance than most other people in the computer field. So we thought that it would be a good idea to test one and see how it



Above The Panasonic PD drive is ideal for testing multimedia applications designed to run on a quad speed CD-ROM

Left Panasonic's PD System combines a 650Mb rewritable optical disk with a quad-speed CD-ROM drive



...and here is the news

- Asymetrix has released a new version of its Toolbook CBT edition (version 4.0), and Aimtech has released CBT Express version 2.0. Aimtech is also said to be about to release a sub-£1,000 version of its IconAuthor package, called IconAuthor Lite. And the new version of Macromedia Director is now shipping (see page 312).

- Data Translation's Multimedia Group has launched version 2.6 of its Media 100 (£8,795, excl VAT) professional non-linear video editing system. This offers broadcast-quality pictures using 2:1 compression, eight tracks of CD-quality sound, and many more features.

- The ubiquitous Microsoft has unveiled two more technologies. One is SIPC — Simply Interactive PC framework — to give some brains (that is, parts of the Windows operating system) to dumb hardware such as VCRs, TVs and consumer hi-fi systems, so that PCs and consumer entertainment machines can communicate with each other via a universal serial bus.

The other Microsoft technology is ActiveMovie, a cross-platform digital video technology for the desktop and the Internet. With this you'll be able to create and deliver titles on multiple platforms with synchronised audio/video and special effects.

Benefits will be fast playback of all popular media types over the Internet and MPEG-1 playback in software-only on a Pentium 90 with a low-cost graphics card at 24 frames per second with 11KHz audio. MPEG II (which will be used on the new Digital Video Discs) is also supported.

This has meant the creation of a new file format: .ASF (ActiveMovie Streaming Format) which is data independent. Streaming means that playback can start without having to download the entire file.

performs in areas related to multimedia development.

The PD drive is, in fact, two drives in one. It is a rewritable optical drive: each cartridge holds 650Mb (about the same as a CD-ROM) and costs £39. It is also a four-speed CD-ROM drive. It can only act as one of these two things at any one time, but it automatically detects what kind of disk is in, and then re-identifies itself.

If you have a SCSI adaptor, installation is simple. If you don't, you have to go through the rigmarole of installing a SCSI adaptor: something which will either give you a nervous breakdown or be as easy as pie, depending on your PC configuration. Panasonic supplies an Adaptec SCSI-2 adaptor, as an option. The PD drive installs itself as two extra drive letters: one for the optical disk and another for the CD-ROM.

The CD-ROM behaves well. The transfer rates and access speeds we got from our tests matched approximately those of the specifications (600Kb/sec and 195ms). The CD-ROM drive also played our Video CD disks — using a Showtime Plus board — with no problems. And we managed to grab CD-audio data via the SCSI port digitally and save it as a WAV file, using Corel's CD player utility.

Of greater interest to us, however, was the optical drive. Because its capacity is near that of a CD-ROM, in theory it ought to be a good means of testing multimedia applications, instead of writing one-off CDs and sending data to CD-ROM

pressing plants. Also, because of the inexpensive disks and relatively fast performance, it should be a good option for backing up. And then there's simultaneous work: it ought to allow you to work on many projects at the same time instead of being restricted to the normal hard disk.

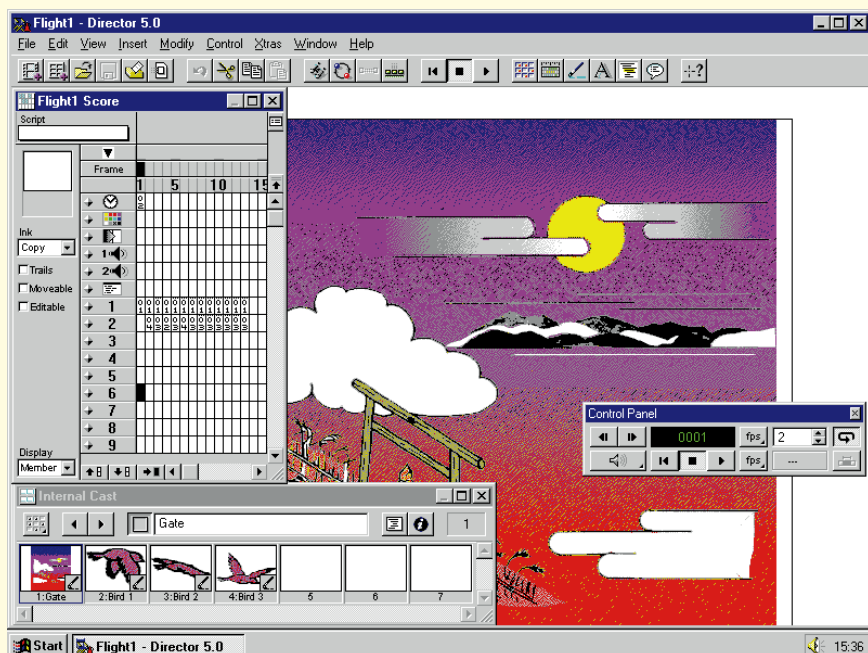
We first tested the drive using standard testing software from Adaptec. The results varied from about 250 to 1,280Kb/sec, depending on the size of the file used (2Kb to 512Kb), and whether access was sequential or random. However, standard software of this kind uses small files for the tests which are not representative of multimedia applications using audio and video files.

In our own, similar, tests of reading and writing large files to the drive we found the average transfer rate to be about 350Kb/sec.

The drive managed to play three tracks of 44KHz 16-bit mono audio files at the same time with no problems, and four tracks with very little crackling noise (four mono tracks amount to 4 x 44.1 x 2 = 352.8Kb/sec).

We also managed to grab video directly on the drive using a resolution of 384 x 288 at 25fps and with a transfer rate of 350Kb/sec without losing a single frame. At a setting of 400Kb/sec it lost about 15 percent of the captured frames. Though you wouldn't actually use such a drive to capture video, you would definitely want to use it for testing playback.

Given, then, that the optical disk's speed and transfer rate are similar to those of a four-speed CD-ROM, the drive will



Macromedia Director 5 now offers support for the Internet, using Shockwave

indeed be perfect for testing material to run from a four-speed CD-ROM, though its performance for material to run from a two-speed CD-ROM will, of course, be on the optimistic side.

As for the drive's usefulness and cost-effectiveness for working on multiple projects, yes, certainly, since the alternatives are still a bit more expensive — and some not even there! The Iomega Jaz and Syquest 1Gb drives we mentioned earlier are still not available at the time of writing and the blanks are advertised at about £100. The cheapest hard disks (which can be made removable) are about £250 for 2Gb. In addition, the PD disks have a longer lifetime than hard disks: they are guaranteed for at least 15 years.

When it comes to sending data to pressing plants on a PD disk, six out of ten places we contacted would accept these disks; so little or no problem on that score.

Our verdict is, therefore, that this drive generally comes up to our expectations. It's really very good for storing data and for testing CD-ROM material and we can recommend it as a good buy for multimedia developers. It's also a very good backup system, and you get a CD-ROM drive to boot (to ruin a phrase!).

A new Director hits town

Macromedia's Director is probably the most widely known and used multimedia authoring package around as far as commercial CD-ROM titles are concerned.

Its great success can be attributed to its dual-platform compatibility (with Mac and PC) in addition to its animation facilities, which suit both presentation-type and

storybook-type titles. Director 5 is the second Windows release, but the fifth for the Macintosh, and as with version 4 you only need to author once, to distribute on both machines.

Version 5 extends itself now to the Internet. As we have seen with IconAuthor 7 (last month), the Internet is clearly the area where development-tools software companies are seeing the largest growth at the moment. We're not saying that the Internet is where most users will get their multimedia information but this is the area where most development will happen. Why? Simply because everyone wants to put pages of their business onto the Net — it's the in thing.

Director's support for the Internet is through Shockwave. This is essentially a software tool which makes the Internet provide support for Director, instead of the other way around.

A utility called Afterburner post-processes Director source files to protect and compress the content by 40 to 60 percent, in order to increase performance. You can control the type and amount of compression for each media type including LZ77 lossless compression, IMA audio compression and lossy image compression.

For longer Director movies, Streamed Media Xtras allows users to receive a constant stream of data from a server to their computers, so that they notice no delay as they view video or listen to audio as it downloads.

You can also connect to the Net from a hot-link in a Director movie played from a CD-ROM or your hard disk. New Network Lingo commands support URLs (Internet

addresses), and can take you to HTML (hypertext) pages on the Net. You can link to other Director movies on the Net, too.

At the moment there's support for Netscape Navigator 2.0, with support for Microsoft Explorer 3.0, CompuServe, AOL/Navisoft, and SGI WebForce to come. If you wish to see an example, visit the Deep Forest Web site (developed by M/B Interactive in the US (phone 001 212 539 6992), which uses no HTML. It's all done using Director movies.

Some of the other new features include built-in formatted text (you can now import RTF files) and there are controls for text manipulation such as kerning, tracking, line spacing and indents. Text is automatically anti-aliased against any background to smooth out jagged edges.

There's now support for Photoshop/Premiere image filters, and you can alter filter parameters over time to create animated effects.

Director 5 introduces a new cross-platform standard for third-party extensions, replacing the use of XObjects and DLLs. It's claimed that Lingo now executes 50 percent faster. Movies can be pre-loaded in the background, giving you more control over managing performance. There's now a Lingo debugger, too; over 100 new Lingo commands, and a new user interface consistent with other Macromedia products.

And there's so-called onion skinning — the ability to see other cast members in the Paint window, making cel animation easier (yes, that's *cel*, which is animation created by moving an object over a background).

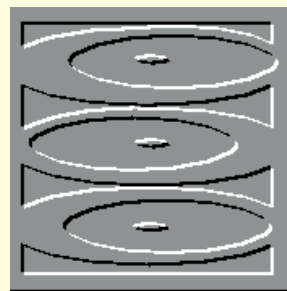
Additionally, it's worth mentioning that OLE objects can now be used as cast members in Director movies.

Director 5 supports Windows NT, 3DO, OS/2, OS/9, SGI and Enhanced CD. ■

PCW Contacts

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Data Translation 01734 796100
Panasonic 01344 853913
Macromedia 01344 55644



It's quicker by bus

Panicos Georgiades and Gabriel Jacobs flag down the miroVideo DC20, a card which uses the PCI bus to speed video capture. Plus, the new IconAuthor for Win95 and the Net.

IN A PREVIOUS HANDS ON, WE stressed that to get good results with digital video it's important to initially capture and work with (edit) video containing as much information as possible — in other words, with very low compression. The final result then needs to be at the higher compression ratio required for distribution.

The bottleneck for capturing video at low compression is usually the hard disk transfer rate. Hard disks have been getting better at this, but the problem with many of the cards designed for amateur use has been the transfer rate between the card and the computer. This problem has been addressed by the use of the PCI bus and from now on you'll see many video capture cards using it (most of the cards on the market still use the ISA bus).

The price is right

The miroVideo DC20 is one of the first of these new PCI cards. It's medium-sized and can capture up to 3.5Mb of data to the hard disk (whereas last year's model, the DC10 using the ISA bus, managed just over 2Mb/sec). 3.5Mb/sec is not really state-of-the-art specification — remember, there are cards out there for professional "broadcast use" — but it is state of the art for a price of just over £700. Not bad.

For a full PAL signal (both fields of 25fps at a resolution of 768 x 576 this works out at a ratio of about 7:1, while for a quarter-screen resolution of 384 x 288 (good enough for MPEG-1) it works out at a compression ratio of about 2:1. The compression method is, of course, M-JPEG (Motion JPEG) and the chip it uses is a Zoran (as with other cards from Fast, Reveal and Spea). In this case, it's the ZR36050.

The card digitises at 4:2:2 YUV (YUV is a luminance and chrominance colour-encoding scheme for natural pictures). This



Above Here, for your multimedia D-light, is IconAuthor, a graphics-based authoring package

Right The miroVideo DC20: the quality of its digitised images is impressive, given its modest price



gives 24-bit colour (as with other cards) when grabbing moving video, but it's also capable of 32-bit colour still-image capture — as are some of the latest flatbed image scanners. It accepts S-Video as well as composite signals (all three TV signal standards: PAL, NTSC and SECAM are supported).

The miroVideo DC20 also includes a video output (S-Video and Composite), and if your hard disk can handle the 3.5Mb/sec transfer rate and capture 736 x 576 at the lowest compression ratio, you can end up with video which is better than S-VHS (Hi-8)

quality. So you can use this card to edit video on a hard disk and output back to tape.

Getting the measure of it

The bundled software includes Adobe Premiere 4.0 LE, Adobe Photoshop LE image processor, Asymetrix 3D F/X, and Vidcap32. There's also a utility program that measures the data transfer rate of

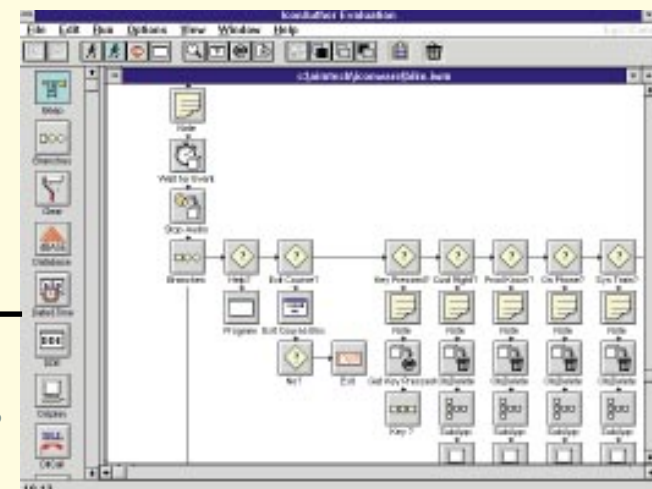
your hard drive, as well as the transfer rate of the PCI bus to memory, since you can also capture directly to memory (as long as you have masses of it).

The card can capture at 16:9 (so-called widescreen). Many films are transmitted using this format nowadays, and you can even buy special TV sets equipped for it. Additionally, you have the normal 4:3 screen ratio.

Before capturing, you can alter the brightness, contrast, saturation, hue, video filter, compression rate

and hard-disk data rate settings.

The card is plug & play and is compatible with graphics cards up to 1,600 x 1,280. There's no feature connection required, and the installation is software based — no jumpers or dip switches to set. However, you do require a Pentium 90 or better, 8Mb RAM or more and a



Held captive by the video question

Over the last six months, about a third of the letters we've received have been about video capture cards and MPEG video playback. It seems that either the interest in this topic is increasing dramatically, or else there isn't enough information available out there. Probably both.

Anyway, we'll bring you as much new information as we can about these topics, as and when we have it. So among this month's goodies, we've tested a new video capture board and bring you the results. Here's a typical email on the subject:

● "Why is it so hard to find out about video capture boards? I want to buy a PC and edit video with it. It's as though companies like miro and Fast are trying to avoid me. Desktop Video companies are trying to sell me configurations I don't need. To whom do I turn?"
fin3bni@arts-01.novell.leeds.ac.uk

You are most welcome to turn to us with specific questions, after you've done your own research: see our review of the new miro board, on the first page of this feature.

● "I am writing to comment on the advice given to James Purbrick (Questions & Answers, February) regarding the question of whether or not to purchase a multimedia docking station. I was wondering if you might be able to put me in touch with Mr Purbrick, because as fellow TI TM4000M owners we may be able to benefit from each other's experiences.

His suggestion of an external enclosure with CD-ROM drive and SCSI disk was the path I took. This was mainly because, for £399, all I got was a two-drive enclosure, stereo speaker pair, double-speed CD-ROM drive and a 3.5in drive bay — not very good value, even at the street price of £300, and after having reclaimed VAT. The TM4000M has a powerful power amp on the output jack and is quite loud with unpowered speakers.

The docking station is really a drive enclosure with speakers built in. However, I solved the problem of requiring active termination by using a CD-ROM drive with internal termination (which can be disabled). The TM4000M has a Fast SCSI-2 port micro-D50 pin. Cables cost a bomb. Termination costs even more."

Jason Tay <100256.3556@compuserve.com>

We sympathise wholeheartedly with the prices of cables using the micro-D50 SCSI connectors; some suppliers charge over £50 for such cables, which is daylight robbery. We're told that only Adaptec makes that type of connector, but we don't believe it. As your letter has appeared here, Mr Purbrick may get in touch with you, but we cannot pass on readers' addresses without their permission.

300Mb hard disk or larger.

Thanks to drivers specially adapted for Adobe Premiere, the producers claim ten times faster display of images in the editing window and computation of motion JPEG files twice as fast. We tested the card on a 133MHz Pentium, which is fast anyway, but were still impressed.

An interesting upgrade option for the card is the miro Mouse, an accessory used to control camcorders and video recorders via control buttons and a jog shuttle. It supports VITC, RCTC and RAPID time codes. This can speed things tremendously when digitising video clips.

Our verdict? The quality of the digitised images is the best we've seen to date for a card costing less than £2,000. For the price, it's probably the best card on the market today.

IconAuthor 7.0

Aimtech's Icon-Author, together with Macromedia Authorware Professional, have been top-of-the-range multimedia authoring packages for a number of different platforms.

They're both expensive, both target the CBT market, and both use similar graphical methods for constructing multimedia applications — tools are dragged from a palette onto a flow diagram. This, it is claimed, eliminates the need for programming, and makes the packages easy to use even by "ordinary" people. Not that experienced multimedia developers aren't ordinary people, of course, but this is how both companies justify the high price of the products. They claim that the pay-off comes in time saved by easy development by non-experienced users. You now have the chance to see for yourselves whether this claim is true by having a go yourselves, using the demo on this month's cover-mounted PCWCD-ROM.

With this new version IconAuthor is now one step ahead of the competition, and takes on board two main contempo-

The really wild cycle show, courtesy of IconAuthor

rary issues: Windows 95 and the Internet. Version 7.0 is 32-bit, so you can experience the better performance offered by Windows 95 (you can also have the long filenames: what a relief to be able to say to Mac users, "Yes, we have that too").

IconAuthor and the Internet

It's also "Internet compatible". But what does this mean? Well, it goes beyond HTML Web pages. New features enable you to create pull-down menus and include drag and drop, timers and combo boxes in your Internet applications.

Perhaps the most important of these Internet-related features is one called Universal Media Access (UMA). It allows you to create applications, parts of which reside on the Internet and parts on CD-ROM or a Local Area Network (LAN). That way, you can put on to the Internet those parts which need to be constantly updated, while keeping back others which need less frequent updating and/or which can't be delivered properly via the Internet due to the low transfer rates of modems. Remember that a 14,400 baud modem (admittedly, without on-the-fly compression) is about 90 times slower than a single-speed CD-ROM drive.

With UMA you can update Internet pages with ease. What's more, you can enter a URL (essentially, an Internet



address) as a path in your path file. Thus you can create your files locally (graphic or otherwise) and store them on your Internet site. When IconAuthor has to access these files, you simply change the name of the path variable.

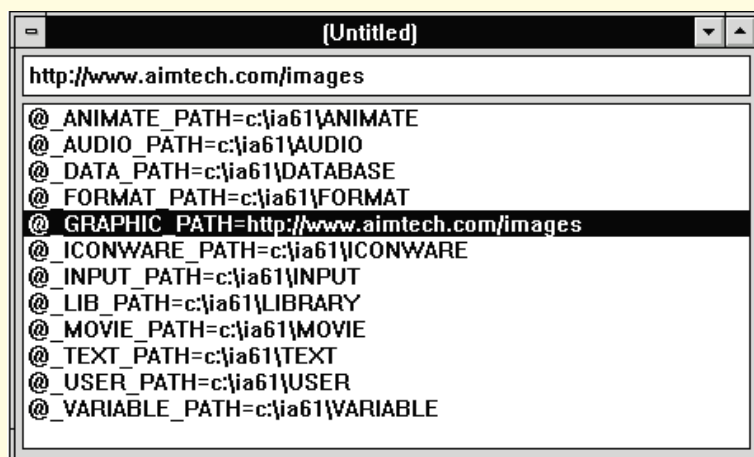
Present tense

You also get IconAuthor Present, a free runtime player which can be set as a helper application in a Web browser (such as Netscape) to launch an IconAuthor application from within a Web page. Aimtech states that it will be announcing specific support for the Netscape API in the future.

Other new features include an image manipulation utility (ImageLab), a palette object for handling palette shifts, a table object to handle the display of spreadsheet and database-type data, zooming graphics, and a search-and-replace facility.

IconAuthor claims the largest degree of platform portability, including Windows 3.x, 95, NT, OS/2, Unix/Motif and the Mac. One small disappointment at present is that Java isn't supported, but Aimtech tells us it's considering this at a later date.

● The demo on the PCW CD-ROM enables you to save but not distribute applications, and you're limited to 100 icons. Because each icon in the flowchart carries out a specific action, the creation of multimedia applications using this demo can be no longer than 100 actions, but you'll find that's quite a lot.



The path variables for an application. The graphic path variable is set to a URL

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miro Computer Products (UK) 01494 510250