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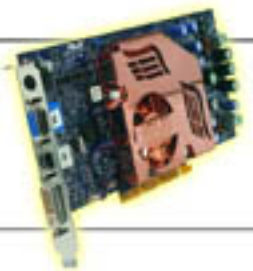

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One Step Forward, **Two Steps Back**

Vinit Aggarwal
Assistant Editor

How many of us own the latest 3G cell phone, 64 MB handheld or a DVD-Writer? Not too many, but we sure wish that we did.

These cool toys have tremendous drool value that's built up by all the marketing hype created around them. And companies need to sustain this hype in order to boast that they've got the biggest, fastest, or most powerful technology product in the world. Plus they get to build a feel good factor with their shareholders, stock analysts and the general consumer who ends up associating any product or technology from that company as the best available.

Why are we letting a bunch of marketers dictate what we need?

We need to realise that the increased utility offered by most of these technological innovations is purely incremental—there's no 'this-will-change-my-life' experience associated with them. Actually, the benefits of most 'cool' technologies are negated when you realise that instead of speeding up efficiency, or allowing us to accomplish the same amount of work in less time, we are often faced with expectations that more must be done in the same time.

Also the gee-whiz appeal with owning the largest hard disk, the fastest CPU and the most powerful video card is short-lived—there's always a better, faster, and more affordable technology around the corner. In the end what's important is whether your new printer is capable of printing more than 500 printouts with a single ink cartridge and not whether it prints at 1200 or 2400 dpi since you won't notice a perceptible difference in the first place. It doesn't matter whether your killer 2 GHz notebook is three times faster than your desktop PC, if it won't let you watch an entire DVD movie during those boring flights without requiring a battery recharge in the middle.

We mistakenly concentrate only on unnecessary 'tangible' aspects of technology—how fast or powerful it is—whereas we need to look at whether new technological innovations fulfil their basic promise of greater convenience, simplicity and efficiency.

What we really need are products and technologies that will simplify and enrich our lives, allowing us to do things we actually care about—more free time for family, personal goals and recreation.

And the only way this will happen is if we look beyond the hype and start demanding the so-called innovators to drive innovations that really matter to their customers—that's you and me.

vinit_aggarwal@jasubhai.com

"The increased utility offered by most technological innovations is purely incremental—there's no 'this-will-change-my-life' experience associated with them"

AUGUST 2002

FEATURES

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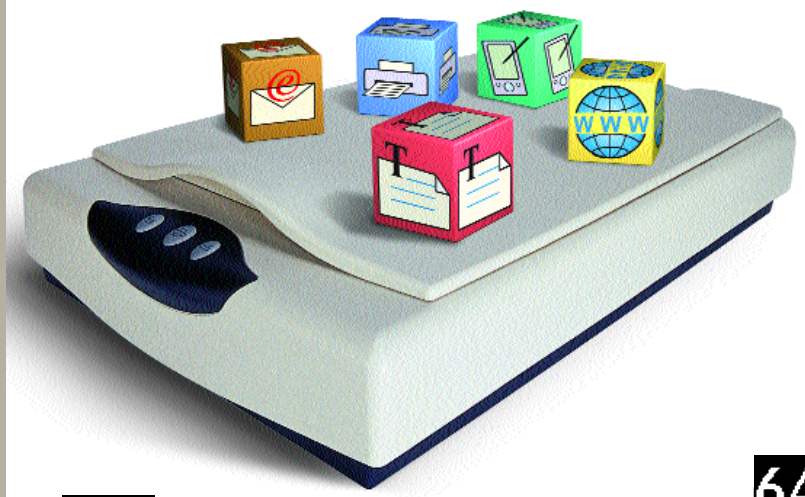

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ON THE CD

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HIGHLIGHTS

FruityLoops 3.5
Size: 7.37 MB Type: Shareware
Mindware\Software\Multimedia

Acropad PDF Creator 1.0
Size: 314.52 KB Type: Freeware
Mindware\Software\Developer

Opera 6.03 bundled with JRE 1.3
Size: 11 MB Type: Shareware
Mindware\Software\Internet

Virtual CD - CD/DVD Drive Emulator 4.3
Size: 8.14 MB Type: Shareware
Mindware\Software\Home

100Share.com Lyrics Search Base 1.1
Size: 4.8 MB Type: Freeware
Mindware\Software\Home

DX-Ball 2 1.25
Size: 1.97 MB Type: Freeware
Playware\Arena\FunZone

Quasar Accounting 1.2
Size: 23.9 MB Type: Freeware
Mindware\Software\Office

Advanced Zip Repairer 1.51
Size: 827.9 KB Type: Shareware
Mindware\Software\System

System Mechanic 3.7D
Size: 1.5 MB Type: Shareware
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Reason 2.0
Size: 4.1 MB Type: Shareware
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MotoGP: Ultimate Racing Technology
Size: 63.6 MB Type: Demo
Playware\Arena\Games

AVIAssembler 1.2
Size: 544 KB Type: Shareware
Mindware\Software\Multimedia

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MUST TRY SOFTWARE

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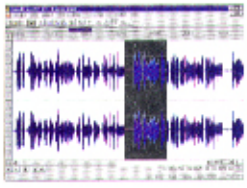

Size: 22.1 MB; Type: Shareware
Mindware\Software\Multimedia

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Dreamweaver MX

Macromedia Dreamweaver MX now caters to professional Web designers and developers. Dreamweaver's integration with UltraDev lets you create dynamic, database-driven Web applications. In addition, its excellent support for ColdFusion, ASP and JSP gives it an edge over the earlier versions.

Size: 24.1 MB; Type: Trial
Mindware\Software\Internet

Soldier of Fortune II

Soldier of Fortune II is the only game that displays unrestrained gore and violence. This realistic first person shooter lets you play two levels as a mercenary-for-hire who has to stop a group of terrorists bent on creating havoc with a life-threatning virus.

Size: 136.9 MB; Type: Demo
Playware\Arena\Games

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WEB SPECIAL

Born to be free?

E-mail came, saw, became a part of our lives…and was then taken for granted. But with pay-for services raising their ugly heads, it's time for some re-evaluation.

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Just Jammin'

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VOLUME 2, ISSUE 8

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DIGIT AUGUST 2002

hypethesis

USB OTG

■ What is it?

A supplement to the already existing USB 2.0 specification. With this standard, USB devices will be able to directly connect to other USB devices. Being backward compatible with prior USB standards, devices based on USB OTG will be able to operate on all PCs equipped with a USB interface.

■ How does it work?

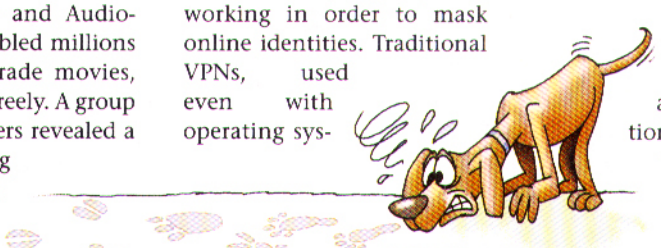
When connected to a computer, a USB OTG device behaves as any conventional USB 2.0 device would. When two USB OTG devices are linked together, the cable sets a default host and a peripheral device. However, if the nature of the application decides that their roles need to be reversed, then a protocol called the Host Negotiation Protocol (HNP) changes the operating status of the connected devices.

■ What does this mean to me?

A digicam could interface directly with a photo printer or another camera to exchange picures. A scanner could join forces with a network printer for sending faxes. These combinations are not possible today because USB has a PC-centric tree topology. The PC is the host (tree) and the USB devices are the branches. USB OTG will allow devices to communicate directly without a PC.

Anonymous P2P

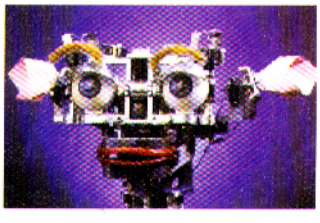
Few of us are unaware of the legendary success of peer-to-peer (P2P) services like Napster and Audiogalaxy, that enabled millions worldwide to trade movies, songs and data freely. A group of veteran hackers revealed a new file sharing standard that promises to take P2P to the next level by increasing security. Developed by a 23-year-old hacker called the Mixter, this protocol is called Six/Four (named after the June 4, 1989 massacre at Tiananmen Square). Six/Four is based upon P2P technologies coupled with VPN (Virtual Private Networks) and 'open proxy' networking in order to mask online identities. Traditional VPNs, used even with operating systems like Windows, establish a secure tunnel between two computers where information can be securely transferred across the Net. In Six/Four, the tunnel follows many computers in the network before finally reaching the destination on the Internet. The greater the number of servers between a user and the destination, the harder it is to trace the user's IP address. Six/Four implements about 100 steps of layered anonymity before it reaches the final destination making it virtually impossible to trace the user. This new protocol was unveiled at the H2K2 hacker conference held between July 12 and 14 in New York City.



ILLUSTRATIONS: Mahesh Benkar

Mushy robots

Cynthia Breazeal, an MIT professor, has built the 'sociable' robot called Kismet, with a cute face capable of smiling, frowning, looking surprised, and mimicking a few other basic emotions.



Kismet responds to the tone of voice, facial expressions and physical behaviour and comes up with an appropriate response. Kismet is much like a child, and is being developed using theories of developmental psychology. The goal is to create a self-learning robot that can pick up emotions just like a growing child and learn from its surroundings.

Traditionally, robots have been designed to operate in hazardous and hostile environments, but now the applications are shifting towards entertainment and health care, where robots have to interact with people and play a part in their daily lives. Kismet promises to be a big step in this direction.

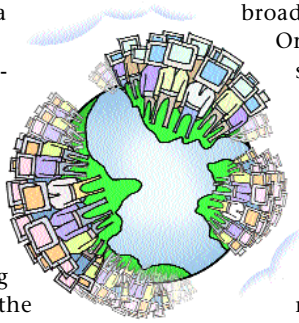
Palm OS 5 unveiled

PalmSource Inc has begun shipping the final version of Palm OS 5 to licensees and developers who can now adopt the highest-performance ARM chips from Intel, Motorola and Texas Instruments. Palm OS 5 will deliver an enhanced user interface that enables increased personalisation, security, multimedia and wireless networking, while maintaining compatibility with today's Palm OS-based software and hardware.

■ Gnutella developer dies at 25 in apparent suicide ■ Counterfeits from China spell trouble for Intel ■ IBM to offer Linux computing on a per-unit usage m

The billionth PC

The personal computer industry has passed a historical milestone as the one-billionth PC was shipped in April this year, according to a Gartner Dataquest research. While it took 25 years for one billion PCs to ship out, Gartner predicts that the two billionth PC will ship out in just six years' time. In 2008, the PC industry is projected to reach the milestone of 2 billion PCs, with the greatest growth opportunity coming from high emerging markets in places such as China, Latin America and Eastern Europe. The Asia-Pacific region ranked as the third major regional market, with more than 100 million PCs being shipped to the region.



The report also predicts that the PC industry will get a big boost in the next few years from ubiquitous broadband services. Once broadband services are available everywhere at data rates exceeding 10 Mbps, the PC will become the central appliance that manages communications and entertainment in homes. Here's to the next 1 billion PCs!

4G in India

India's Ministry of Information Technology has formed a new wireless technology group to develop the fourth-generation wireless standard. The plan is based on a study by Vinay Deshpande, former president of the Manufacturers' Association for Information Technology and H.S. Jamadagni, a professor at the Indian Institute of Science.

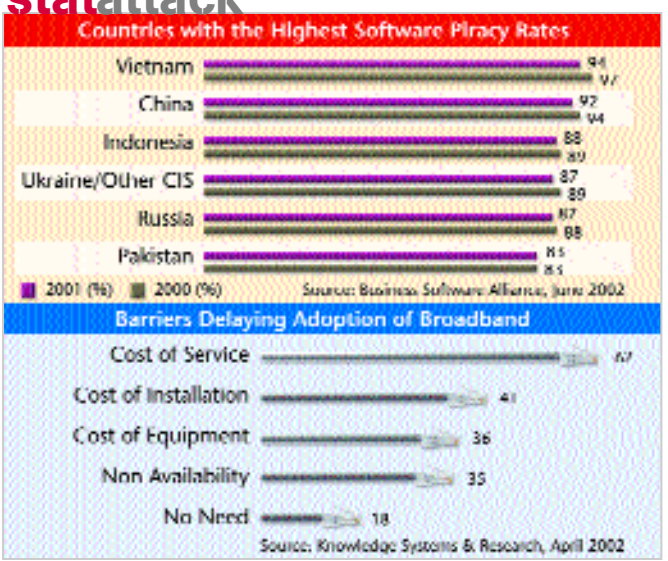
Snail mail meets e-mail

In what could be termed as an interesting experiment, China plans to marry e-mail and snail-mail to provide a convenient alternative to Internet users. China Post, the official Chinese postal service, will soon introduce the service which will allow anyone with a computer to type an e-mail, send it across to the postal service, where the mail will be printed, put

in an envelope and be hand delivered to its destination. There is a large potential market: according to government figures, mainland China had 33.7 million Internet users at the end of last year. In a country of 1.3 billion, that means only a tiny fraction has access to e-mail.

The Chinese postal service hopes to bridge this digital divide by attracting medium-sized and small companies along with appropriate entrepreneurs with this offering. Although the relatively high-cost of the service will initially keep individuals away, hopes are that the venture will take off and eventually drive costs down to a level that will be affordable by the common man.

statattack



INFOGRAPHICS: Jaya Shetty

redalert

JPEG virus

Here's something that you don't see very often—a virus that affects JPEG images. Called Perrun, the virus appends itself to JPG files and requires an extractor to extract and execute the virus code. It arrives in the form of an 11,780 byte portable executable or EXE file. When executed, the 5,636 byte extractor component (EXTRK.EXE) is dropped to the current directory and a system Registry key is modified.

Perrun is relatively harmless. Systems without the Perrun extractor component are not affected when they open an infected JPEG file and if the extractor is installed, you are safe as long as you don't open infected JPEG files. To prevent infection, ensure that your antivirus software is updated. Also check if the size of JPEG files has increased by the specified amount.

Shakira's here for the monsoons

The latest Internet worm spreads by inviting you to open an infected mail that promises to display pictures of pop star Shakira. The VBS/VBSWG.aq@MM worm contains the subject line, 'Shakira's Pictures', with the body of the mail reading, 'Hi : i have sent the photos via attachment Have funn…'. The attachment has the filename 'ShakiraPics.jpg.vbs'.

It spreads via Outlook and Internet Relay Chat (IRC) and overwrites .vbs and .vbe files with its own code. However, the damage caused is minimal. Install the latest virus updates for your antivirus software and delete any suspicious e-mails.

■ Microsoft stakes IP claims on OpenGL ■ IC makers, OEMs define next-generation digital interface: HDMI ■ Yahoo! gets a facelift—new home page

Lets talk Open Source

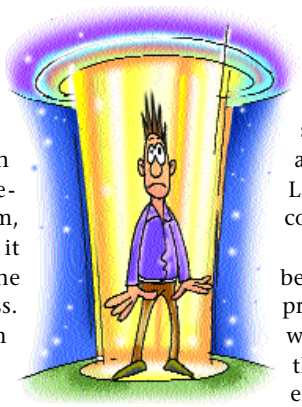
The power and utility of mobile devices is always on the rise—cell phones that double up as PDAs, PDAs that can do multimedia and so on. This scenario is about to get better with the cell phone bigwigs showing a trend of adopting open source technologies, paving the way for third-party developers to create applications that can talk to the next generation of mobile devices. For example, the new Nokia 7650 phone has aborted the Psion Link Protocol (PLP) that was used by Symbian and has now moved over to the standard TCP/IP protocols. Work on this is being carried out by Jeremy Burton of a company called Intuwave, in conjunction with Mark Melling who earlier worked with Symbian.

With the path now paved for developing on open protocols, the route is far easier for Linux and Macintosh developers to create software for these new phones. Already Linux and KDE hackers have successfully integrated support for Psion-based handheld computers directly into the operating system's interface.

With many such advances on the way, the erstwhile PLP protocol can now be safely relegated to the recycle bin since Psion does not make PDAs any more and the protocol is quite dated.

Aussies teleport laser beam

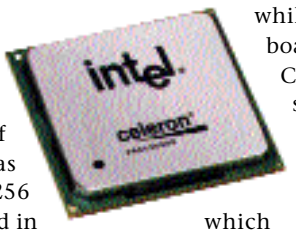
A team of physicists at the Australian National University led by Dr Ping Koy Lam has successfully disembodied a laser beam at one location and rebuilt it at another spot about a meter away and in the blink of an eye. The team teleported the beam, *Star Trek* style, but it got destroyed in the recreation process. However, Lam claims that day is not too far when solid matter could be teleported from one location to another. "My prediction is that it will be done in the next three to five years—that is the teleportation of a single atom." But since humans are made up of zillions of atoms (one followed by 27 zeroes), the possibility of a *Star Trek* like transporter is remote. "In theory, there is nothing stopping us from doing it, but the complexity of the problem is so huge that no one is thinking seriously about it at the moment," Lam told a news conference.



The immediate benefits of such a process lie elsewhere. The breakthrough opens up enormous possibilities for super-fast and super-secure communications systems and quantum computing, over the next decade. Physicists believe quantum computers have the ability to solve problems millions of times faster than conventional computers.

The new Celeron

Intel unveiled its first Celeron processor based upon a 0.18 micron architecture with a Pentium 4-derived core. Debuting at 1.7 GHz, this processor will feature 128 KB of L2 cache as opposed to the 256 KB of cache found in the P4 processor. Architecturally, the core of this new Celeron is no different from the Willamette core of the P4 that was launched in November 2000. This processor operates on motherboards based on Intel's i845 and the i850 chipsets. Due to DDR and RDRAM support offered by these chipsets, their memory bandwidth would be significantly higher than that offered by the erstwhile i815 motherboards. The new Celeron uses the same Quad-pumped bus that is utilised by the P4, which translates into 3.2 GBps of bandwidth—enough to support this processor at its current speed.



The icing on the cake? It's priced nearly 40 per cent cheaper than the P4 1.7 GHz. Tests have also indicated that this processor lends itself well to overclocking and could become a poor man's P4 if tweaked!

C for graphics

Programmable video cards have been with us for some time now, but the promise of special effects and real-time cinema-quality graphics remains largely unfulfilled. A large part of the blame can be put squarely on the need for assembly-level programming to get anything good out of these video cards. Working at a hardware level is a time-consuming and non-intuitive process that few programmers wish to get into. This is where nVidia hopes its latest offering—a high-level language termed Cg, 'C for Graphics'—will offer an easier solution.

Cg is an attempt to replace OpenGL and Direct3D and also offers cross-API transparency in which the same code can run on Windows, Linux, Mac OS X and the Xbox. Cg will work with both, nVidia and non-nVidia hardware and is compatible with the upcoming DirectX 9.0 High Level Shading Language. In short, Cg will allow game developers to utilise powerful pixel and vertex shader effects and finally put them to their intended use.

As it approaches maturity (expected by October this year) a better picture will emerge on its capabilities and limitations.

snapshot

VSNL stands to lose Rs 3.5 billion if WorldCom Inc files for bankruptcy following the accounting scandal

Source: Reuters

■ *Pac-Man* headed for Sprint 3G ■ RealNetworks to launch GamePass monthly subscription to give free and discounted games ■ *Doom III* possible for Xbox

Hijacked by a salesman

LivePerson Inc offers customer service chat solutions for some 3,000 Web sites. It is now pushing a technology it calls Proactive chat to engage online shoppers upon arrival.

"I'm a live rep here to answer questions and offer promotions," says Cole when you first visit *TechnoScout.com*. "What product did you wish to chat about today?" *TechnoScout.com* is one of the first e-commerce sites to try Proactive chat. As soon as you enter the site, the salesbot asks you what you need help with. It then directs you to the product or tells if the site does not stock the particular item. The salesbot can even get you attractive discounts.

One of the biggest e-commerce firms, *eBay*, has signed a deal with LivePerson to help surfers register bids. Instant communication and problem resolution is appealing both to Web sites and their users.

Quite contrary to LivePerson's claim, Esteban Kolksy, a Gartner analyst, described Proactive chat as "one of the most annoying experiences of my life. When you do proactive chat, you don't know what the person is looking for, you just get in their faces".

Macworld Expo 2002

The largest convention for Mac-addicts, the Macworld Expo was held on July 17 in New York. Apple showed off some new gadgets and added new features to some old ones—their iPod audio player now works with Windows. Also unveiled was the new high-end Mac with a 17-inch monitor. Enhancements in Mac OS X include an improved address book and increased interoperability between the computer and cell phones. But there's some bad news for Mac aficionados—they will now have to pay for the .mac e-mail address and Internet storage.

snapshot

15 million

people expected to share digital images on the Net in 2002

Source: Gartner Dataquest

Go play outside!

A research study conducted by Akio Mori, a professor in Nihon University's College of Humanities and Sciences, links playing video games with reduction in mental faculties. The activity of the human brain can be associated with brain waves—

electrical signals that are sent out by the brain cells. Two such waves were used as pointers in this study—beta waves indicate liveliness and activity and alpha waves are emitted when resting. Mori analysed the brain waves of 240 people aged six to 29 years, and categorised the results according to the type of person being studied. The first category consisted of people who rarely played video games and showed stronger emission of beta waves, implying an active mind. Those who spent between one and three hours each day playing games had roughly equal beta and alpha waves before each gaming session. However, once they started playing games, the beta activity rapidly decreased below the level of alpha activity. In those who spent between two and seven hours each day, beta activity was constantly near zero, even when they were not playing. "Many video games stir up tension and a feeling of fear, and there is concern that this could have an effect on the autonomic nerves," Mori said.

Interestingly, the study group did not play anything cerebral like *Civilization III*, or even a fairly strategic action-game like *CounterStrike*. Mori centered the study on Nintendo video games.

heroes

Gaming consoles

Console game sales received a very healthy boost when Sony Computer Entertainment America sold over 5,20,000 PlayStation 2s in June 2002 in the US and Canada. In similar vein, Microsoft's Xbox sold around 2,30,00 units and Nintendo's Gamecube console moved 1,12,300 pieces.

E-governance

The Madhya Pradesh government, along with Microsoft, is embarking on a project that aims to bring about various levels of e-governance in its different departments and operations.

zeroes

Online shopping

Joseph D'Amelio thought he'd found a great deal on eBay—a 2000 Porsche 911 for $50,000. After talking to the seller and getting a copy of the car's confirmation sent to him in advance, he wired the money to an escrow company and fell victim to an elaborate scam. The seller had actually hijacked a legitimate eBay member's account and set up a fake escrow service.

P2P

American legislators are readying a bill that could sharply limit Americans' rights relating to copying music, taping TV shows and transferring files over the Internet. This could seriously cripple P2P services and could have an affect on other users worldwide.

■ Universal Music to put its library online ■ Panasonic will launch a drive to read multiple DVD formats ■ China threatens unlicensed Internet cafe owners

The new pay Napster

Napster, the radical MP3 swapping application that started the peer-to-peer revolution, has opened a new chapter. Faced with dire financial situations, it reached an agreement with German media company Bertelsmann AG to offer a secure music file sharing service.

A beta program was started early this year, involving reworking of the software to integrate Digital Rights Management, accounts, audio fingerprinting, etc to work in tandem as part of the application. Despite a few spoilers like the download limit of 50 tracks a month and the inability to burn the downloaded music on CDs, the new Napster still feels like the old one. Its best feature—browsing through a real person's music collection, sending them messages and recommending new music—still survive. But the options to write songs on to a CD or move them to a portable player are noticeable by their absence, as is the option to search for MP3 files alone. The music player built into the software seems good enough, though the playlisting feature is a bit wobbly. But even with the ability to chat with other users and browse through their hard drives (albeit only the copyright-cleared .nap tracks), it is tough to find tracks to download. But in terms of technology and how true it has stayed to the original model, the new Napster could still be a winner.

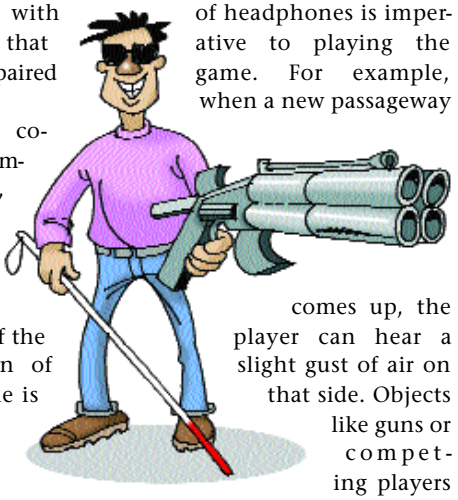
Blind games

What started off as a friendship has developed into inspiration. Jeremie Spitzer and Paul Silva at the University of Massachusetts were hanging out with a visually impaired friend, Tim Keenan, when they decided to make computer games with such strong audio that even the visually impaired could play them.

The trio have co-founded a small company called ZForm, which is presenting its first product, an online video poker game, at the convention of the National Federation of the Blind. The game is quite simple: it tells the player the cards he is holding and what the other players are doing.

Spitzer maintains that the blind and sighted can compete on the same level in this video game. ZForm is also building a prototype of *Quake*, the ultimate proof of their work.

Modifying *Quake* to create an environment with only sound cues hasn't exactly been child's play—a pair of headphones is imperative to playing the game. For example, when a new passageway comes up, the player can hear a slight gust of air on that side. Objects like guns or competing players give off characteristic sounds, their direction indicated by their relative volume.



quoteworthy

"We're starting to shrink [chips] less rapidly than in the past"
Intel's Gordon Moore states that his prediction of chip performance doubling every two years may start to slow down from now on as the physical limits of processor fabrication are being reached

"Then we'll have options, and we like to have options"
Steve Jobs, on the fact that Apple is first concentrating on the company transitioning over to OS X before considering moving from using Motorola chips in their computers to Intel chips

snapshot

Losses due to software piracy in Asia-Pacific pegged at $4.7 billion in 2001

Source: *Gartner*

tomorrow'stechnology

Autonomic computing

Researchers at IBM have identified a problem that has long been associated with computing—far too much time is spent in maintaining the system itself than getting the job at hand done. If computing systems can take care of themselves and adapt to situations as they arise, users would have more time to think about working with their actual applications. Inspiration for this computing philosophy was drawn from the most brilliant autonomous system found in nature—the human body, which transparently takes care of all complex functioning like telling the heart when to beat, moderating temperature and repairing damages.

Autonomic computing will be a marriage of fields like artificial intelligence, neural networks, control theory as well as cybernetics. It promises systems with the ability to dynamically adjust to external conditions, diagnose errors and bottlenecks and take appropriate action, protect itself from external threats, optimise and anticipate information delivery for the fastest possible operation—and all this is going to be transparent to users, enabling them to concentrate on the task at hand.

Working systems are already being demonstrated with 'cellular' chips that can recover from damage or failure and heterogeneous systems that can manage workloads over networks.

■ Tuned-up version of Morpheus imminent ■ Vinod Dham, brain behind Pentium, to invest in Indian hardware industry ■ eBay buys PayPal for $1.5 billion

Encouraging words

Dear Vinit,
I am an engineering graduate and a mother of two. For all these years my career has remained totally stagnant and I was very much confused, but your 'Back to School' editorial in the July 2002 issue has encouraged me to mobilise my career. Please carry on the good work.

Bomali B.
Via e-mail

digit

Dear Bomali,
It's very encouraging for me to hear that my modest thoughts have helped your resolve in any way. I wish you all the best for the future.

Incomplete picture

Hello Vinit,
I am an avid reader of Digit and often base my purchase decisions on the reviews in the magazine. I was happy to see the digital camera test in the July 2002 issue, but was disappointed when I noticed that high-end cameras were not covered. Why wasn't the Sony Digital Mavica (which writes to a CD-RW) included in the test?

Rohit Rate
Via e-mail

digit

Hello Rohit,
Even though we've seen a sudden spurt in the number of digital cameras available in the market, the reality is that most of these digicams are targeted towards entry-level users. We had originally planned for an exhaustive comparison test ranging from sub megapixel cameras to the very high-end models (in excess of 3 megapixels), but had to change our focus since there is very little demand (and iffy availability) of these high-end cameras which cater to an extremely niche audience.

All lines on this route are busy

Dear Vinit,
We're faithful readers of Digit and look forward to every new issue. We were very excited when we saw the free phone card from Phonewala.com with the July issue, as our sister resides in Pittsburg, USA. But the site **www.phonewala.com** refuses to open even though all other Web sites are working fine. This was a rude shock to us as we never expected our beloved Digit to mislead its readers.

Himanshu and Anupama
Via e-mail

digit

Dear Himanshu and Anupama,
I can understand your disappointment. Phonewala.com is an authorised Internet Telephony service provider and its services rank amongst the best available. However, it's possible that their site may be blocked by your local ISP to prevent you from accessing telephony services from a third party.

Test cases

Hi Vinit,
Digit is truly the best technology magazine in India. The hardware reviews are very well written. However, you are yet to review computer cabinets in any of your issues. Buying a cheap cabinet with poor ventilation and inferior build quality could fry up an Athlon CPU! I want to see a detailed benchmark of available PC cabinets in the near future.

Trinanjan Bhanja
Via e-mail

digit

Hi Trinanjan,
Yours is the first letter we've ever received asking for a cabinet comparison test! But you need to realise that computer cases form the last piece of the computing puzzle for most users who have more pressing considerations such as which processor, monitor or video card to buy. Since this is a most unusual request, I'd like inputs from our other readers as well: log on to **www.thinkdigit.com** and vote on whether you'd like to see this comparison test in an upcoming issue of Digit.

Code of conduct

Dear Vinit,
I have been purchasing your magazine regularly since the last three months, but I do not find anything related to programming languages like C, C++, VB, etc. Please include some tutorials in future issues.

Rajesh Malik
Via e-mail

digit

Dear Rajesh,
Digit is an end-user technology magazine that provides information on the latest technology trends, product reviews and workshops that help you enhance your computing experience. Hence, programming languages find very little (if any) mention in the magazine. I suggest you try *Developer 2.0*, our sister publication that caters to software programmers in India.

Your vote counts

Q. What kind of 30-minute Quick Starts would you prefer?

Basic	Advanced	Huh?
26%	56%	18%

Our readers have spoken—look out for more advanced Quick Starts in the future issues.

This month's question:

"Which amongst these four comparison tests would you like covered in an upcoming isssue of Digit?"

- DVD-ROM drives
- Mice and other input devices
- PC cabinets
- Multi-functional devices

*Log on to **www.thinkdigit.com** and vote on it*

Old is gold

Dear Digit,
The June issue was absolutely fabulous and it contained everything one could ask for. I also liked the fact that you have resorted to the old style of writing reviews—individual write-ups for each product, accompanied with the price, overall grade, pros and cons. Do stick with this.

Siddhartha
Via e-mail

Dear Siddhartha,
Look closely and you'll notice that we've only blended a bit of the old style in our current tests. While some of our readers have asked us to revert to the old style of reviewing each product separately, we stand by our decision to compare every product against each other by means of a consolidated analysis as is necessary for a comparison test. The individual product review boxes you've mentioned only serve to highlight some of the better performing products.

Vote for CD

Hi Vinit,
I have a few requests for the Digit CDs. Please include America's Army in your next issue. Also, I'd like to see more mods for Quake III Arena, Return to Castle Wolfenstein and Serious Sam. Better still, why not let the readers choose, through a vote on your Web site, or by any better method, the software that they want included in the Digit CDs?

Debashish Mukherjee
Via e-mail

Hi Debashish,
That's a great idea as it will provide our readers with the software they want and also prevent unnecessary arguments between the CD content coordinators on whether they should include one 200 MB software or five 40 MB ones. Browse over to **www.thinkdigit.com/vote4cd/** and choose the software you want included on the October 2002 CDs (yes, you'll need to bear with a slight delay while we compile and evaluate requests every month).

Dhoondte reh jaaoge

Dear Sir,
I have been collecting every issue of Digit from the very beginning and have a huge collection of CDs. However, locating a particular software is a major problem. Earlier you used to include a software archive on the CD. Why don't you start this service once again?

M. Subramanian
Via e-mail

Dear Mr Subramanian,
In case you missed our last reader poll, we promised to include the software archive with this month's CD. And you should know by now that we never break our promises. The software archive is back and you can find it on the Mindware CD or you could check out the online version at **www.thinkdigit.com/cdarchive**. We've completely overhauled the software archive to give it a new look, enhanced search capabilities and greater filtering options, but owing to time constraints we'll take a few months to add all the content from the older issues to the archive.

Short Bytes

Superb

Hi Guys,
Each month I see Digit getting younger and prettier. The comparison tests are simply great. How do you guys manage to test so many products every month?

S. Sarathe
Via e-mail

Hi S.,
Unlike what some believe, we don't have a magic wand that we twirl every month and hey presto! The tests are completed! Getting all those products tested is hard work and the guys at our Test Centre deserve all the credit.

Well done

Dear Vinit,
I am a great fan of Digit and eagerly await the 1st of the month. The magazine is simply superb and I really appreciate all the effort you put into making every edition absolutely memorable. Thank you for doing such a wonderful job.

Joy Thomas
Via e-mail

Head2Head: Magazine or CD?

Dear Vinit,
I have been a regular reader of Digit and have witnessed an increase in the number of covermount CDs (from one to two) and a decrease in the number of editorial pages (from in excess of 150 to around 130 pages) over the years. Please keep in mind that there are readers who have limited access to a PC and buy Digit for the magazine alone. I feel it would be better if you introduce a copy of the magazine without any CDs.

Swaminathan Karthik
Via e-mail

Dear Editor,
I really love the Digit CDs. I was wondering, whether it would be possible for Digit to be published entirely on a CD. I bet the digital Digit would solve a lot of problems, including the paper crisis.

Hemanth Hariharan
Via e-mail

Send your letters marked 'Readers Letters' to the Digit office:
D-222/2, MIDC, TTC Industrial Estate, Om Sagar Building, Nerul, Navi Mumbai 400 706,
Phone: 022-7629191/9200 Fax: 022-7629224
E-mail: readersletters@jasubhai.com

Goof Ups

- To a query from our reader, K. Amit, in the July 2002 issue (Q&A, page 104) we wrongly mentioned using System File Checker with Windows Me. The correct solution would be to run msconfig.exe and then extract the required file from the Windows Me CD. We thank our diligent reader Mohan for pointing this out.
- In the HTML editing software test in the July issue, we wrongly mentioned Wipro Infotech as the contact for Macromedia Dreamweaver MX (page 80). The correct contact is: Macromedia, 022-8201705, nchawla@macromedia.com

Notice any goof-ups? Write to goof@jasubhai.com

UNITED LINUX

A coalition of Linux vendors promises to bring some order to the increasingly chaotic Linux distribution market

Gurunandan Bhat
Professor, Goa University

> "Unlike bottled water, the exercise of building a distribution goes beyond mere superficial branding and packaging"

Packaging and marketing a Linux 'distribution' is a bit like selling bottled water. Take something that is freely available, add value to differentiate your distribution from the rest, create a brand and then hope that your intended audience shifts their loyalties. But unlike bottled water, the exercise of building a distribution goes beyond mere superficial branding and packaging. Linux distributions tend to be judged by the ease with which they install, their adherence to standards, the simplicity with which they can be customised and maintained, as well as the quality of support and availability of upgrades and bug-fixes provided by the distribution maker once installation and deployment is complete.

Today, over 200 Linux distributions are fighting for a share of the market, each one targeted at a unique set of deployment scenarios and end users. Mandrake and Lycoris (earlier called Redmond Linux) are clearly targeted at the desktop user, Debian is for the austere security-conscious GNU enthusiast and RedHat and SuSE for the enterprise user. The 'freedom' to choose from a large number of Linux distributions does have a frustrating aspect since distributions go their own way in matters such as mandating the location of system files, startup scripts and configuration tools. These differences have also necessitated distribution-specific certification.

The announcement of a new consolidated Linux distribution—one that brings together four frontline Linux distribution vendors and called rather ambitiously 'United Linux'—is heartening. The four vendors are Caldera, SuSE, Turbolinux and Connectiva—the number is expected to increase as more vendors join the coalition. Though RedHat and Mandrake are not yet a part of the United Linux coalition, the announcement has been greeted with hope and relief from industry heavyweights such as IBM, HP, Computer Associates, Borland and SAP. Designed to be an enterprise-class, industry-standard distribution, United Linux is being promoted as a single, stable and uniform platform for application development, certification, and deployment allowing Linux vendors, Independent Software Vendors and Independent Hardware Vendors to support a single high-value Linux offering rather than multiple different versions.

This bodes well for desktop Linux users who have to battle with the fact that each distribution has its own proprietary packaging standards for binaries. RedHat, Mandrake and SuSE use the rpm (RedHat Package Manager) to distribute applications but a SuSE rpm won't install cleanly on a RedHat or a Mandrake system. If this broad coalition of vendors can work towards addressing and resolving these issues, United Linux would be a significant catalyst in the widespread acceptance of Linux.

Many years ago, Caldera, one of the partners in the United Linux initiative, released a delightful Linux distribution that allowed the user to play tic-tac-toe during the install. The idea that a Linux install could be as easy as tic-tac-toe was revolutionary for those times. Today most distributions, with their increasingly improving ability to detect hardware and configure drivers, have matured to an extent that ease of installation is no longer a stumbling block. It is time now to move on to life after tic-tac-toe and how United Linux performs there will decide the future of Linux, whether United or not.

Gurunandan Bhat teaches at Goa University and works with Synapse—a Goa-based non-profit organisation working in the area of Information Technology and Media. He has been an avid Linux enthusiast since 1993

ILLUSTRATION: Mahesh Benkar

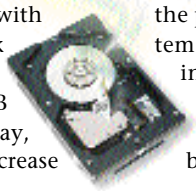
STORE MORE!

A cornucopia of information stored on something the size of a sugar cube or a postage stamp...brace yourself to be enveloped in all the digital information you could ever dream of accessing!

Each time you watch a fast-paced DVD movie or pull down a piece of information from the Internet or even access the ATM at the corner of your street, you are actually tapping into large repositories of digital information. The ability to store large amounts of digital information has brought about the various comforts and possibilities that we are so used to—ready access to any kind of information, portable entertainment devices that fit in the palm of your hands, blazing fast portable computers, data farms for enterprises and movie experiences that can challenge reality itself.

How big is big?

The rate of advancement in storage technology has been truly amazing. From the first instance of digital storage with IBM's 5 MB RAMAC hard disk drive invented in 1956, all the way to the mammoth 180 GB hard disk drives available today, there has been a 36,000-fold increase (yes thirty-six thousand!) in storage capacities over the last 50-odd years.



However, we are fast approaching the physical limit for storing information on media such as the magnetic platters of hard disks or the chemical layers in optical devices such as CDs and DVDs. With the promise of tomorrow's operating systems incorporating stunning graphical interfaces that offer truly immersive virtual reality and next generation games that will blur the line between fiction and reality, the

demands of being able to quickly store and retrieve enormous quantities of data are ever increasing.

Scientists are now exploring hitherto uncharted territories, delving into advanced sciences such as holography, nanotechnology and advanced lasers. The implementation of these technologies will result in an increase in storage capacities, which is equivalent to what we've seen over the last few decades!

Research in these fields has created storage solutions such as holographic storage, blue laser and Millipede—each offering digital storage densities that are orders of magnitude greater than anything we know and use today. Even though devices that use these technologies are still on the outskirts of implementation, they are slowly and surely advancing down the road to commercial availability. The implications of what these technologies promise us is as dramatic as when we compare any of the commercially available gigabyte solutions today with the clunky sub-10 MB storage devices that were first used in computing!

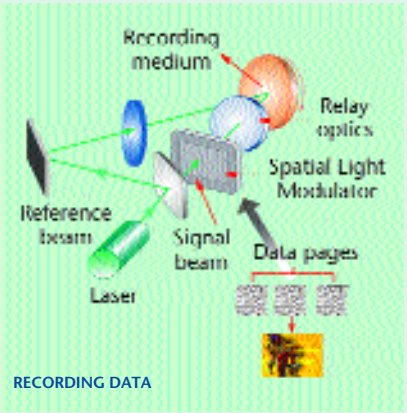
Holographic storage

Consider the maximum data storage limits we have reached today: 15.9 GB on a double-layer, double-sided DVD? 180 GB on the largest hard disks? Think about a system that can store about a terabyte of information (that's over 1,500 CDs!) on a crystal the size of a sugar cube! Sounds like science fiction? Today, this is closer than ever to science fact! Holographic storage is a breakthrough technology that literally goes beneath the surface of the media and stores information within its volume. Current generation storage media store digital information on layers of platters either magnetically or optically. Holographic storage utilises the space within special types of crystals with optical characteristics, which are very similar to those used to create 3D holograms (the kind that you find in holographic stickers or on some product packages). Even though holographic storage has been around for over a decade now, giants in the field of technology such as IBM, Lucent and Rockwell are just beginning to make serious breakthroughs with this technology. Holographic storage incorporates the use of lasers, optics, image sensors and special crystals that respond to laser light.

Besides the astounding amount of data that can be stored using this technology, there are other inherent advantages that holographic storage offers. The main advantage is the speed of retrieving the data—such systems will be able to retrieve data in tens of microseconds as compared to a data access time of almost 10 milliseconds offered by the fastest hard disks today. By the time they are commercially available, scientists say holographic systems could transfer an entire DVD movie in under 30 seconds! Another very important advantage is that of information search and retrieval. Consider the case of large databases that are

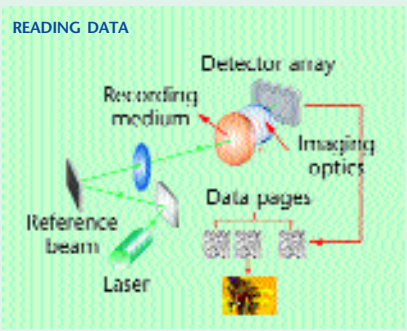
Inside a Holographic Data Storage System

In this simplified representation of a Holographic Data Storage System, the main component is a blue-green Argon laser,

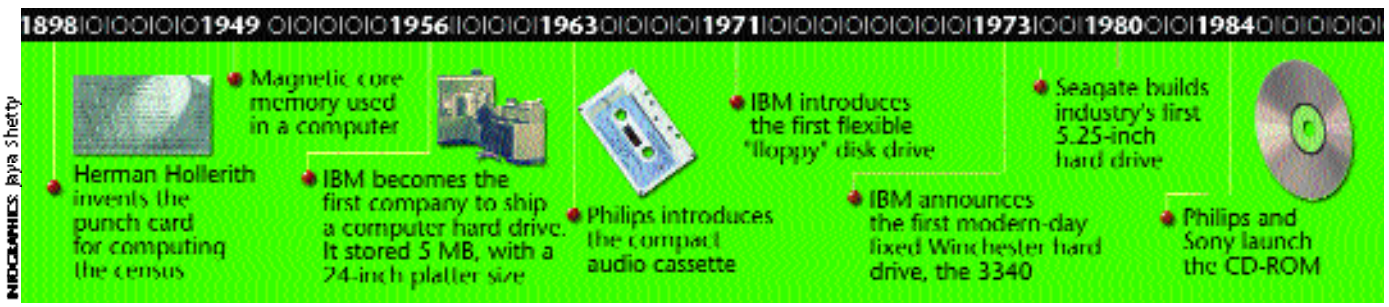


which is split into two separate beams through a beam splitter. The first beam (object/signal beam) goes straight and passes through a special device called a Spatial Light Modulator (SLM), which is very much like a conventional LCD. This screen is fed with a page of binary data, which shows up as clear and dark boxes. When the signal beam passes through this device, it picks up this page of information. The resulting image is precisely focussed through a series of lenses on an area in the light-sensitive recording material, which is made of lithium-niobate crystal. To record the information, a second laser beam (the reference beam) is focussed on the exact same spot as the object beam that contains the data. When both these lasers meet inside the crystal, a phenomenon called interference occurs and an image of the data is created within the crystal in the form of a hologram.

To read back this page of information, the reference beam needs to be focused at exactly the same location as it was when the hologram was first created to store the data. The hologram of the data inside the crystal



diffracts this laser and the resulting page is projected onto a CCD (charge coupled device) sensor, much like the sensors used in digital cameras. The binary information can now be read from this CCD and the originally stored data is retrieved.



stored on hard disks today. To retrieve a piece of information, you first provide some reference data (say, a keyword), the data is then searched for by its address, track, sector and so on, after which it is compared with the reference data. In holographic storage, entire pages can be retrieved, where the contents of two or more pages can be compared optically (light patterns are compared) without having to retrieve the information contained in them. Imagine what this would imply in the field of data mining and warehousing—massive sets of data values can be compared in fractions of a second!

While this technology points to an almost utopian era for storage, there are a number of roadblocks that need to be overcome before you can buy a 1 terabyte holographic crystal from your local hardware store. The success of holographic storage lies in the ability to accurately focus the reference laser on the exact position within the crystal to retrieve that page of information (*see box, 'Inside a Holographic Data Storage System'*). You would be unable to locate the data if there's an error of even a thousandth of an inch. Also, the crystals used in the fabrication of the storage element need to exhibit very exacting optical characteristics to store the data correctly and there are very few substances that adequately and economically meet these needs. The good news is that scientists indicate that holographic storage systems should be available in the next five years and they would debut with capacities of about 125 GB with a data transfer rate of 40 MBps.

Millipede

Flashback to 110 years ago to the age of the punch cards. This was the first device that could be used to store digital information. It was based on a very simple principle of indentations on cards that were read by a machine and translated into 0s and 1s. Fast forward to today. IBM has recently developed a very similar system but has scaled it down to extremely small dimensions, almost bordering on the realm of atoms! Known as Millipede, this technology is theoretically capable of storing information equivalent to about 25 million books in an area the size of a postage stamp! (*See box, 'The Operational Concept behind Millipede'.*)

One of the most obvious advantages with this technology is the fact that very large storage densities can be achieved in very small areas. Lower power consumption makes it ideal for mobile applications such as handheld computers and cellular phones—your next generation cellular phone would be able to hold a gigabyte of multimedia content and contact information! The main hurdle that lies in the path of commercialisation of this technology is the fabrication of the controllers that go into these chips.

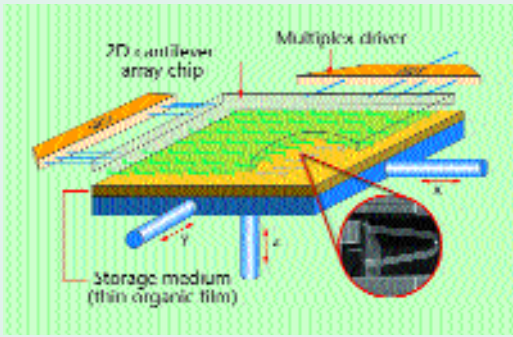
Blue laser

Lasers have long been used in the optical storage of digital data. We see them in everything from CD-ROM to DVD and magneto-optical drives. Information is stored in these devices by encoding data into a stream of 0s and 1s in a spiral on the surface of the media. The amount of digital information that can be stored on a single layer of optical media depends on two factors: the size of the encoded bits on the media surface and how close these bits are packed onto the surface. The density of these bits is directly dictated by the wavelength of the laser beam that reads them. The shorter the wavelength of the light, the narrower is the laser beam, and consequently the smaller can be the size of the bits of information that are encoded on the disk (*see diagram, 'DVD vs Blue Laser CD'*).

As of now, the lasers used in CD and

The Operational Concept behind Millipede

The Millipede chip is created using an array of very tiny cantilevers to create almost atomic-sized indentations in a plastic substrate that is used as the recording material. This array works in a massively parallel fashion where a bank of cantilevers access or create information.



Before a read or write operation, the polymer-based medium, which is just about 50 nanometers thick, is positioned beneath the cantilever array. This medium is mounted on a magnetically driven scanner that can move in three dimensions. During read-write, the medium is moved by the cantilevers along the X-Y axis while the cantilevers actuate and create indentations on the recording surface. Using this process and with a single cantilever design, researchers have managed to achieve a storage density of an astounding 60 to 80 GB per square centimetre. Also, this substrate can be 'erased' and data can be re-written onto it repeatedly. This is achieved by momentarily heating the polymer to a temperature of 150°C so that the surface is effectively smoothened and ready for rewrite. However, individual bits of information cannot be erased; only larger sections of the polymer surface can be cleared. The image above also shows an actual electron microscope image of one of the Millipede cantilevers. The tip of the cantilever head is about 50 Angstroms wide—that's just a few atoms clustered together!

Battle of the Bits

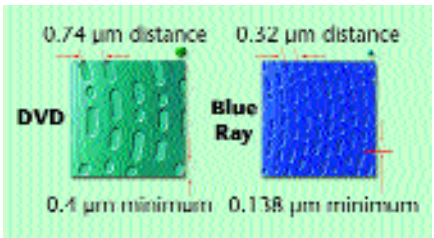
	Blue Laser	Holographic Storage	Millipede
Storage capacity	30 GB per layer per side	Terabyte class	80 GB per square cm
Technology used	400 nm wavelength laser	Optics and holography	Nanotechnology
Data transfer speed	Medium	Very high	High
Cost of implementation	Relatively low	High	Medium
Time to implement	1-2 years	5-7 years	4-6 years
Applications	Enhanced DVD applications	Data mining and warehousing	Storage for mobile and portable devices
Companies involved	Hitachi, LG Electronics, Matsushita, Pioneer, Philips, Samsung, Sharp, Sony and Thomson Multimedia	IBM, Rockwell, Lucent	IBM

DVD-ROM drives have a wavelength between 630 nm and 650 nm (1 nm = 1 millionth of a millimetre), which puts them in the red band of light. The reason why blue lasers are so exciting is because their wavelength lies in the 400 to 450 nm range. This shorter wavelength light translates into disks written with blue laser being capable of storing between 25 to 30 GB of data per layer per side! That gives it five to six times the storage density of existing DVDs. Imagine having all the *Star Wars* movies with full-blown surround audio and crystal-clear video quality on a single disk with room to spare!

If it is simply a question of using laser light with a smaller wavelength, you might ask why this wasn't done before. The reason for this is that the materials used to generate blue lasers have a relatively shorter lifespan compared to those used for red lasers. While blue lasers are still in the research phase, there are three types of methods that are used to generate these lasers:

Zinc Selenide (ZnSe): The initial method for implementing blue lasers involved the use of Zinc Selenide to fabricate the diodes that generate blue lasers. However, this material has a relatively short lifespan and its power requirements make it economically unsuitable for commercial implementation. Also, these lasers have wavelengths ranging from 460 to 520 nm, putting them at the end of the blue and closer to the green light band of the spectrum.

Gallium Nitride (GaN): This material has proved to be very successful in the creation of blue lasers and has generated wavelengths as low as 370 nm with relatively high reliability. Most of the work in blue lasers today is based on this material.



The shorter wavelength of the blue laser allows for more data than on a DVD

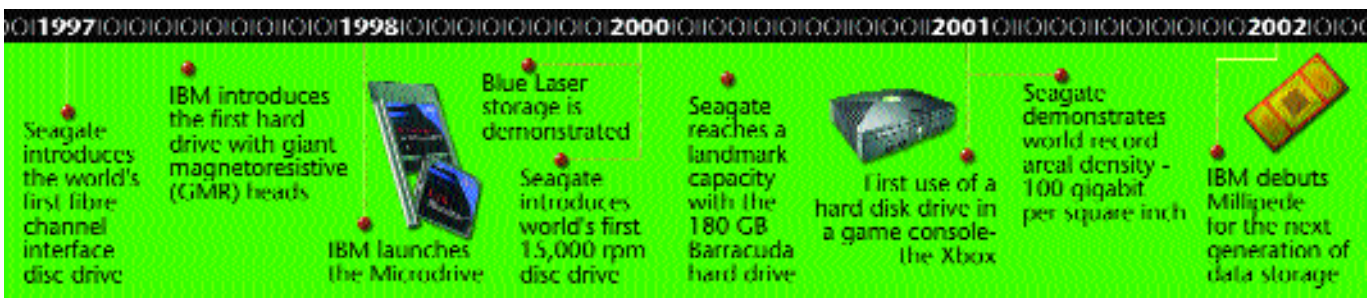
Second Harmonic Generation lasers: These lasers are relatively new on the blue laser scene but have exhibited very high levels of reliability. Through this intelligent method, the frequency of a given laser is doubled (that is, the wavelength is halved) and laser light within the blue spectrum is generated. This is done through an apparatus called a Distributed Bragg Reflector (DBR) where, for example, the frequency of an infrared laser with a wavelength of 850 nm is doubled, resulting in a blue laser with a wavelength of 425 nm.

It will be some time before blue laser technology becomes commercially viable. The major hindrance to this technology is the cost of implementation. A Blue-ray device available today would cost about Rs 2 lakh! The second hurdle is that of reliability: red lasers that are used in all CD-ROM and DVD-ROM drives today have a life cycle of about 10,000 hours. Now compare that to the meagre hundreds of hours that the Gallium Nitride-based blue lasers last for using today's technology! However, it is just a matter of time before these issues are addressed. Scientists predict that in just a couple of years nearly all new optical storage devices would be based on blue lasers.

Looking ahead

While the very thought of the storage capacity offered by these path-breaking technologies is overwhelming, there will soon come a time when we will think nothing of being able to copy a 10 GB computer game onto a terabyte-class storage device. But this is going to take time. All these technologies are still only limited to the confines of a handful of well-guarded research laboratories. These technologies will be available for mass consumption only when the materials and the technologies used to fabricate these mammoth storage systems become economically viable.

MARCO D'SOUZA



Philips 50PF9964 Plasma Display

Size does matter

Philips has created the ultimate display for those who lust after larger-than-life movie experiences. This multi-functional, flat panel, 50-inch wide-screen plasma video display is the ideal companion for your DVD player. The 50PF9964 imparts clarity that blurs the line between movies and reality. All right, so this giant screen does not exactly fit on your desktop, but once you find a wall large enough to accommodate it, brace yourself for the ultimate home theatre experience.

Web site: www.philips.com

ROCK & ROLL!

toys for audiophiles and entertainment junkies

Sony DAV-S500 DVD Dream System

There goes the neighbourhood

The new DAV-S500 is an elegantly designed, full-fledged home entertainment solution. It incorporates a DVD and CD player along with CD-RW playback capability and 5.1 Dolby Digital surround sound support. For those who expect nothing but the best in their music, this is one of the few systems that supports the new multi-channel Super Audio CD format. With a power output of 200 watts RMS, be prepared to rock your neighbourhood!

Web site: www.sony.com

Sony DCR-PC5 Mini DV Handycam

Make yourself handy

Sony is taking digital video to new extremes in portability with the introduction of its smallest Mini DV Handycam. This new camcorder uses Sony's Memory Stick media, a high-performance Carl Zeiss lens, a 2.5-inch SwivelScreen LCD Monitor with Touchscreen controls and an advanced InfoLithium battery that will help you make the most of your recording time on the road. With an astounding 120x digital zoom and a CCD resolution of 0.4 megapixels, this camcorder brings all the action up close and personal!

Web site: www.sony.com

Beatnik DM2

Mix and scratch

The DM2 is an affordable, easy-to-use sound generation device that allows music enthusiasts to create, perform and publish their music from their PC. The only device of its kind, it's a godsend for amateur digital DJs. It combines two scratchable decks, a sampler, a cross-fader and an effects box, all in one unit. With this little gizmo, you will be able to create real-time club music mixes even if you don't have any turntable or studio experience.

Web site: www.mixman.com

Alesis airFX

It's in the air

This intriguing musical toy lets you make smooth flanges, crazy grooves and cool sound effects without having to touch a thing. Connect the airFX to any line-level sound source and speaker system and then simply move your hands through an invisible 3D sphere above the device to manipulate the sound in an infinite number of ways. The smallest movement is captured by airFX's onboard DSP to generate a corresponding sound. With amazingly intuitive usage, one moving part and 50 presets, this effects processor is for musicians as well as the tone deaf.

Web site: www.alesis.com

ILLUSTRATION: Mahesh Benkar

HARDWARE FREAKS

The latest Pentium processor, the best gaming console, the most expensive handheld are what they crave. Let's meet some people who only get out of their beds because of their lust for technology...

You must have come across them at one point in time or another—the shy, introverted type, with a few opinions on the latest movies or the hippest serials, and a taste in music that you find hard to digest. They'll rarely pose for a photograph or show up at social events. But mention technology in general or computers in particular, and their face lights up. Somehow they suddenly seem to come alive. You've just encountered a technology geek, or as they prefer to call themselves, 'A Digital Guru'.

They are out there

"She was a thing of beauty, a joy to work with. Thin, sleek and very easy on the eyes... damn, I miss her!", says Kinnar Sanjanwala, an otherwise normal man, about his Apple notebook. "It's bad enough that my wife doesn't understand my passion, did she have to make me give her away?" Err... her away? "I called her [the notebook] Emily, from that Pink Floyd song. It isn't that strange you know. We give names to things we cherish, kids, pets...Heck! I know a guy who has named his shoes! At least with an inanimate object you don't have to worry about getting the name wrong."

Guys like Kinnar are not an uncommon breed; you will meet them in the unlikeliest of places, doing the most normal of things (Kinnar is a chartered accountant). But once you get to know them, it won't be too long before their love for anything remotely related to technology emerges. And even if you can't identify yourself with their passion, it's infectious and chances are, they'll pass it on to you.

This 'passion', as Kinnar puts it, runs deep—it gives them a foundation to build their world upon and a feeling of power. Remember the time you had to call a friend because your PC was being its essential self—a pain? Chances are, your call for help sounded something like, "Hey Mangesh, could you help me out please, I think my computer hates ➜

me. I have some very important and urgent work to finish, and the damn thing refuses to start." And Mangesh being the almighty Hardware God (and he knows it) would of course reply with "Yeah, you know what? I'm watching *Farscape*, and it would be great if you could call back in an hours' time, so later, okay?" Of course you'll call back, because you know that if anyone can solve your problem, it's him.

So how do these guys get into technology? Is there an induction ceremony to be performed, complete with pacts that have to be sealed with blood on full moon nights? Chris, a self-confessed hardware lover explains, "I'm not sure how it all happened. It started out when the family Hewlett-Packard P2400 was acting up. I had to get a new motherboard, then some RAM. I started researching so that I could build the next PC from scratch. From that point on I have just been hooked on to hardware. At first, it was only the desire to run the latest games but later it grew into an all-consuming hobby."

There is an evolution angle to it too, as Chris adds: "Now I am more interested in getting the most performance from lower-end parts rather than buying the best—this is much more fun and easier on the wallet."

Chris, all of 16 years of age, already knows his SMPS from his SMTP. A gamer at heart, is he able to balance his studies and his passion? "I try not to place studies too high. Since I plan on getting a career in gaming, my game time becomes my study time. But so far I have done okay, although there have been a few times when I have had a gaming spree and neglected my studies." So are there times in his life when he would rather be playing games than anything else? "Well, sometimes I do feel like that, but it's not going to be for much longer. I'll soon have my own PC and a house, and will be able to game all I want. So I just keep thinking about that." Does he plan to move out and change cities? "I'm trying to get into a college in the US, so I guess that could be considered changing cities."


Chris, Hardware Freak

But riding the hardware ride is an expensive thrill. Every six months or so, there is something new on the scene—a new video card, a faster processor, and if you are into gadgets in general, the temptations are many and avenues of escape, very few. Being a 16-year-old, what do his parents think about all this? More importantly where does he get the money from? "I am lucky. My dad likes computers and uses them a lot so he doesn't mind the upgrade cycle; I don't spend money on much else, so most of it goes into computers," says Chris.


Utkarsh Dalmia
HARDWARE FREAK

> "Power excites and just having a powerful system at my disposal gives me immense satisfaction"

If it isn't broken, tweak it

Overclocking is the art of running your computer at speeds much faster than they were meant to run. It's akin to tuning the engine of your car for better performance, or replacing the engine altogether for that my-Maruti-800-can-go-faster-than-your-Ford-Ikon bragging rights. Overclocking falls into the much broader category of modding (geek-speak for modification). It is a process not without its risks, so why do it? "Why? I wanted the best performance for the lowest possible price. It is amazing what one can do when limited to a small amount of resources and a lot of time." Chris and modding are inseparable. The only thing that comes close to his passion for modifications is an equally fervent desire to overclock his PC.

> "There have been a few times when I've neglected studies while on a gaming spree. But I have eventually recovered"

For some people budget is not the only reason. Take the case of Utkarsh Dalmia. He is 19 years old, lives in a different part of the country, but talking to Utkarsh is like talking to a Chris clone—they share the same love for hardware and games, even their tastes in music run similar, and both of them overclock and modify their computers. Utkarsh chips in: "It is the desire to experiment, to optimise. I want the best experience possible from my computer, so when I upgrade, it is always cutting edge. For example, my next upgrade will be before *DOOM III*. Right now, no game can stress my PC."

So the driving force is the games then? "Not really, sometimes it's just for the testosterone feed. Power excites and just having a powerful system at my disposal gives me immense satisfaction. It is like zipping at high speeds in a Ferrari." But before we put this down as a need for speed, at whatever cost, Utkarsh clarifies, "It's a balance between practicality and desire—you can never have the fastest computer for long. Newer stuff releases every week, so buy what you can afford and then tweak it to get the performance you desire!"

Utkarsh also has a fairly elaborate scheme to source his money: "I lived in Singapore for about six months. You can buy the latest hardware at half the price you'd have to pay here. My dad has an office there, and some old college friends; so the *modus operandi* is that I do the price search online, decide what I want, and then import it to India". And if you thought that the custom duty would be a killer, Utkarsh has that covered too: "...just put it in a bag or two, no problem"! After six months or so, when it is time to upgrade, Utkarsh sells his old hardware in India at a premium; then uses the net amount to fund his next object of desire. It is a beautiful cycle that works for Utkarsh. What about his nagging parents? Any lectures on saving money? "...lots of lectures, but I plan my purchases at birthdays, or when I get good grades. And basically, since I don't ➜

Spot-a-Geek Contest

Are you a true blue techie, or just another wannabe? Take this quiz and find out!

1. John Carmack is...
a. The forward in the American soccer team
b. Just another guy named John
c. The one true God
d. Not as pretty as Killcreek

2. If you are stranded on a desert island, and allowed only one possesion. What would it be?
a. My PC
b. My girlfriend
c. You mean I'd have to leave my chair?
d. My PC, my girlfriend, my fridge... (Help! I can't count)

3. Your girlfriend caught you cheating on her, what do you do?
a. Apologise with chocolates
b. Ha, ha, that would never happen, I'm too smart
c. Say it with flowers
d. Ha, ha, that would never happen. Err... what's a girl?

4. You've inherited lots of money! What are you going to do with it?
a. Put it in the bank
b. Buy that cell phone I've been dreaming about!
c. GeForce 4! Here I come!
d. Donate it to charity

5. So you are invited to a formal event. What would you wear?
a. My best tuxedo/dress
b. My neighbour's best tuxedo/dress
c. My black Gorillaz T-shirt and those torn jeans.
d. Hey I told you—I am not leaving this chair!

spend much of their cash (thanks to the magic buy-sell cycle), they don't mind".

More than just computers

But hardware does not begin and end with computers. There are other objects of desire, ranging from cell phones, to PDAs, MP3 players and game consoles. If it is shiny and requires a power source to run, you can bet these guys are interested. The case of Kinnar and Emily comes to mind. Ask him about gadgets though and his smile turns to an evil grin, as he removes his Nokia 7650 cellphone. "Sexy isn't she? I just got her. It pays to have contacts! What I would really like to own is Sharp's Zaurus SL-5000—it's a PDA that runs Linux and Java applications. It has a very neat keyboard that slides out. I think I saw an ad that offered the PDA free with a Linux development kit. Since I want it bad enough, I think I'll buy the kit, just to get at the Zaurus." Surprisingly, Kinnar isn't what you'd consider a geek; he just likes collecting shiny gadgets and naming them!

Not all gadgets are created equal, as Chris points out: "MP3 players are pieces of trash and a waste of money. You need 128 MB of RAM just to get an hour of good quality music on one of those. If I ever buy a compressed portable audio player it would have to be a Mini Disk. Right now I have a Sony Discman which does all I need it to do." And since he is a certified gamer, a console can't be far behind: "I considered a Nintendo Gameboy Advance (a handheld gaming console) but once I actually got to try one out, I dropped the idea—it wasn't very comfortable with the small buttons seated so close to each other. The other consoles I have owned are the Nintendo Entertainment System, Sega Genesis, Sony PSOne and Nintendo Gameboy." But monetary problems forced Chris to make some sacrifices: "Right now I only have a Sega Dreamcast. I had to sell the others."

The conversation slowly tilts towards modding. "I have been considering a Dreamcast mod, but never got around to completing it. I wanted to shift the guts into a wooden case and put a 120 mm fan on the back. I opened it up and checked out the insides, the idea is quite possible," says Chris. One can only shake one's head in disbelief.

Utkarsh shares the console passion with Chris—he owns a Nintendo 64, a Sega Dreamcast, a Sony PlayStation 2 and more peripherals than you can shake a stick at. He is also quite sad: "I had planned to go to my friend's place and check out the Xbox, but he bailed out on me. I really wanted to check it out." With the next generation of consoles raining down upon the gaming masses, lines have been drawn between the supporters and the opposition, and fights on the scale of Mahabharata, are not unheard of.

At the end of the day what will this fervour get them? The fact is that a gadget freak, by definition, knows the inner workings of his latest procurement—the theory behind its working and even the industrial trends that will dictate where his passion will take him six months from now. If tempered with the right professional training, a technology guru can go very far in this digital world. They make great engineers, professional technical help providers and assemblers. They can even work in the game development sector or teach at IT training centres. The avenues are limited only by their imagination.

So there you have them ladies and gentlemen—a race of individuals who set alarms on their gaming consoles, a breed that eats technology information over breakfast and laughs in the face of hardware problems. They are out there, trading in the latest gadgets that most of us can only dream of getting our hands on, let alone owning them. They will laugh at you, they will help you out, they will bug you with facts and figures on the rising trend of mobile handsets, and they will constantly surprise you with the amount of money that they spend on satiating their passion. Are you one of them? Stand up and be counted.

AHMED SHAIKH

SCOREBOARD

Question	a	b	c	d
1	10	5	15	20
2	15	5	20	10
3	10	15	5	20
4	10	15	20	5
5	5	10	15	20

20-40: *You poor thing, you need help dialling a telephone.*
40-55: *Okay, so you can tell a cell phone from a PDA, but don't let it go to your head!*
55-70: *You think gadgets are cute, but only if they come in different colours, preferably polka-dotted.*
70-100: *You've won yourself a life long subscription to Digit. Send in your cheque for Rs 10,000 to...*

How we Test

It looks good and the technology is glitzy, but does it do the job?

The Digital Media Test & Research Centre (DMTRC) conducts a series of elaborate tests to evaluate the merit of each hardware and software product. To ensure that our readers have all the information they need to make an informed buying decision, engineers at DMTRC evaluate and review the latest hardware, software and technology services in accordance with the most up-to-date evaluation processes and methodologies used around the world.

Comparison Tests

We use a dual rating system, the first of which is applied to the Comparison Tests in which we compare the performance of products within a particular category.

Each product is evaluated under different parameters such as performance, value for money, features, warranty and support, etc.

Weightages are then applied to the various test parameters according to their importance for that particular category of products.

These weightages are then used to arrive at an overall grade for each individual product. An overall grade of A+, therefore, indicates that the product is close to perfection.

The Awards

Digit awards outstanding products by selecting a Best Performance and Best Value winner in each comparison test. The winner of the Best Performance Award will be the product that scored the highest in the performance segment of our tests. This award represents the best performing product in our tests and doesn't factor in any other parameter such as value for money, features, support, etc. The winner of the Best Value Award will be the product that scores the highest in our value for money parameter which is derived taking into account the ratio of a product's performance and features to its price. The product winning this award offers good performance at a great price.

In Bazaar

The second part of the rating system is used to evaluate individual hardware and software products in the Bazaar section. The evaluation covers parameters such as performance, ease of use, value for money and the build quality/features of the product in question and then arrives at an overall rating.

Here each of these parameters is given a weightage of 25 per cent and is rated on a scale of 5, which is represented by arrows (▸).

The greater the number of arrows, the better the product. This simple five-point rating system is designed to give you an easy-to-interpret assessment of a product. For example, a product that receives an overall score of five arrows signifies an outstanding buy!

The 5-point Rating System used in Bazaar

▸▸▸▸▸	**Excellent:** a brilliant combination of price, performance and features—far beyond expectations
▸▸▸▸▸	**Good:** a good buy, better than most products in its category
▸▸▸▸▸	**Average:** reasonably competent but nothing spectacular about the product
▸▸▸▸▸	**Mediocre:** does not live up to expectations, needs improvement in many areas
▸▸▸▸▸	**Poor:** has serious drawbacks and needs improvement before it can be used for its target application

Digital media TEST & RESEARCH CENTRE

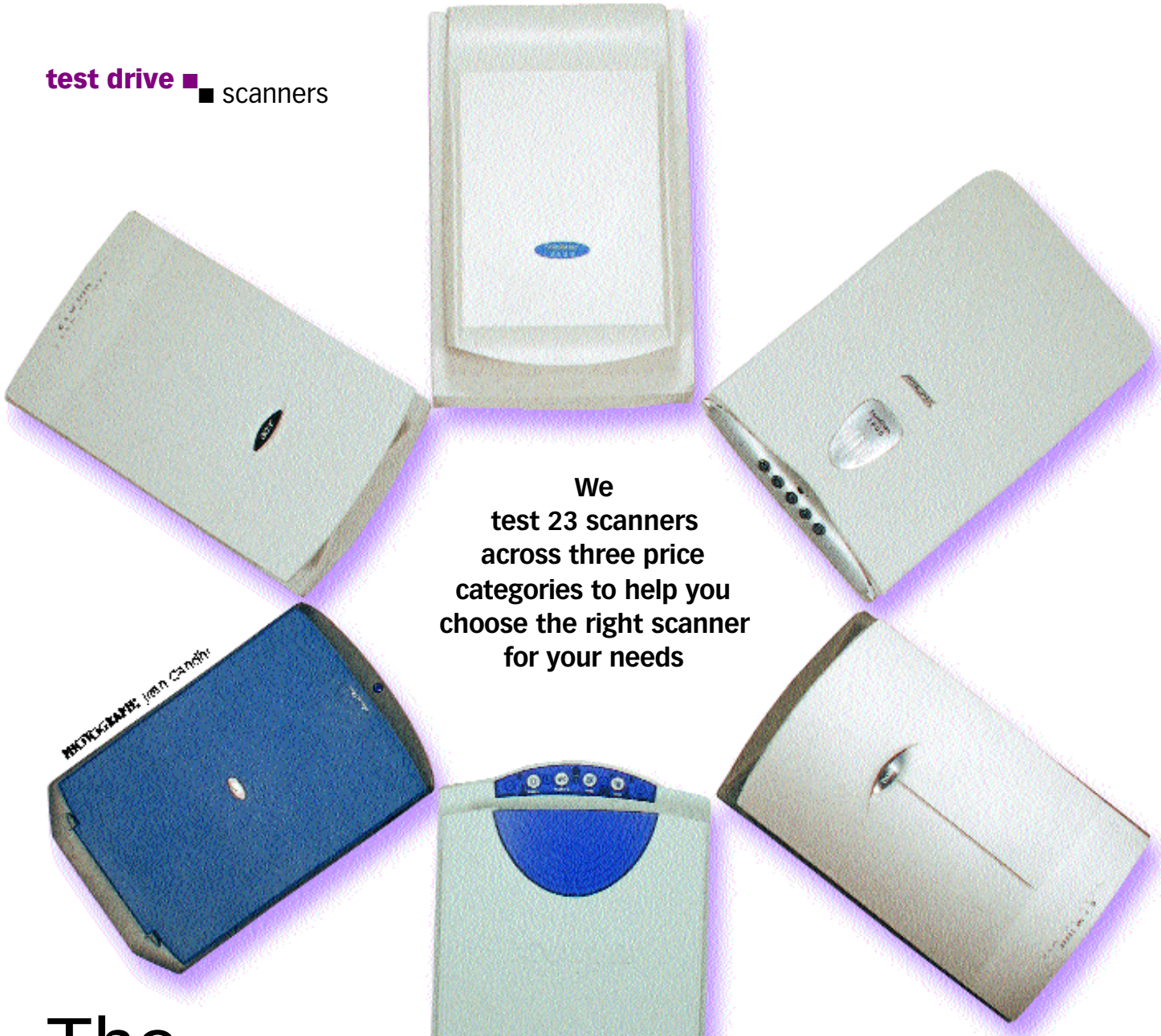
In Test this Month

In our featured comparison test we evaluate 23 flatbed scanners across three price brackets for applications ranging from general home use to full-blown professional imaging. Find out which scanner is best suited to your needs as we torture these scanners through our wide range of speed and image-quality tests.

Going in tandem with the scanners test, we also check out five OCR software that will get you closer to that dream of a paperless office (or home). With higher accuracy levels and an ever-increasing number of features, these new-generation OCR software can digitise all your paper into searchable, editable digital information.

It's taken a long while, but the graphics chips comparison test that you've been waiting for all these months is finally here. You can now purchase the right graphics card for your needs, based on our exhaustive comparison of the latest graphics chips available in the market. Also find out whether the GeForce4 Ti 4600 deserves its drool status among gamers worldwide!

In our Bazaar section we bring you the first-ever test of some of the hottest products and technologies in the country. This month we put the formidable Intel Pentium 4 2.53 GHz through a battery of benchmarks and tell you whether it lives up to all the hype.



We test 23 scanners across three price categories to help you choose the right scanner for your needs

The Real picture on scanners

You plug in a scanner, throw a photo onto the glass, and push one button without even starting the software and hey presto! It's scanned! Scanners have become so user-friendly that almost anybody can use them. Plus, they are a great multipurpose tool for the office and for professionals. From putting images on the Web to digital data management, it's all possible.

Scanners are the link in our effort to digitise the analogue real life that we live: the average person wants a colour scanner for photos, graphics or plain document scanning. A small to medium business enterprise might be looking for a scanner that can do fast black and white scanning which can later be OCR-ed into editable text. Graphic artists or desktop publishers and professional imaging studios might be looking for an ultra high-end, specialised, feature-packed photo scanner.

So how do you go about choosing a scanner? Is a 32-bit scanner better than a 36-bit scanner? Obvious? What about resolution? Do you need 600 dpi (dots per inch) or will 300 dpi do the trick? And what's this stuff about optical resolution versus

interpolated resolution? Still obvious? What if we told you that there are 11 scanners to choose from that cost just under Rs 6,000?

Specifications, prices, features and a whole lot of mumbo jumbo will only lead you to choices that are made out of confusion. But worry not! We have tested 23 scanners in three categories split by price, and have come up with the best scanners that you can choose from.

Digit Test Process

The scanners were categorised according to price as:

- **Budget scanners:** Up to Rs 6,000
- **Mid range scanners:** From Rs 6,001 to Rs 12,000
- **High-end scanners:** Rs 12,001 to Rs 20,000

The test system used to evaluate the scanners consisted of a Pentium III (Tualatin) 1.2 GHz processor, 256 MB SDRAM and a 40 GB, 7,200-rpm IBM Deskstar hard disk drive. Since the performance of the scanners would be affected by the interface it uses, we configured the parallel port to operate using the ECP+EPP mode. Where the scanner offered two modes of interfacing with the PC, we used the faster interface for testing. Hence, if the scanner supported Parallel and USB ports, we used the USB port and for those with USB and SCSI ports, we used SCSI. We used Photoshop 6.01 to evalute the scanned images.

The operating system loaded was Windows 2000 Professional with DirectX 8.1 on a cleanly formatted system and the image of the drive with the operating system and all the basic drivers were loaded using Norton Ghost. This image was then restored after each scanner was tested so as to eliminate any interference from previously loaded TWAIN drivers.

Test methodology

We evaluated the scanners on various parameters such as features (30 per cent weightage), performance (40 per cent weightage), warranty and support (10 per cent weightage), and value for money (20 per cent weightage).

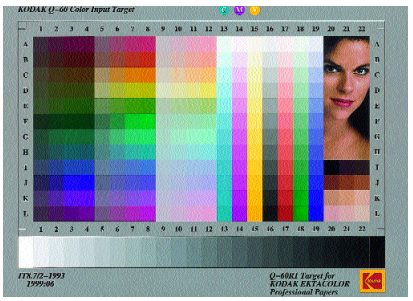
Features: We awarded points depending on the features and the capabilities of the scanners. These included the maximum resolution supported, document scan area, colour depth, and bundled accessories such as power adapters and interface cables. We also evaluated the software bundled with the scanner for basic image editing capabilities such as image scaling, colour and gamma correction, effect filters, batch scanning, and network scanning support. As beginners might be overwhelmed with the plethora of features that modern scanners offer, we checked the quality of documentation and manuals shipped with the scanners for quick setup instructions, a troubleshooting guide and after-sales support and contact information. This parameter was given a 30 per cent weightage in the overall score.

Performance: Each scanner was subjected to a range of tests that evaluated their performance on three basic criteria: scanning speed, quality and the ability to capture high-quality images. This parameter was given a 40 per cent weightage.

a) Scanning Speed: We scanned a text document and a colour photo in various modes at a constant 300 dpi. We scanned the text document in black and white mode and the photo was prescanned and then completely rescanned in true colour and greyscale modes. The time taken to scan in each mode was noted using a stopwatch.

b) Image Quality: This consisted of two tests:

- **The IT8 card test:** An IT8 card was used to determine the ability of a scanner to differentiate between dark, light and bright coloured areas (tonal variation). The IT8 card has three distinct areas (light, dark and bright), with three sub areas each. We took readings of the standard deviation values (using Photoshop 6.01) of the red, blue and green channels of these three areas (including all the sub areas) and compared them against a reference value. A higher tonal deviation score in each zone indicates that the scanner can differentiate between the varying tones in a much better fashion. To arrive at the final score for each area, we took the average of all three readings for each sub area. Hence, 27 readings were taken in all, which on averaging came to nine different readings per area. We also measured the tonal deviations in greyscale mode by observing the tonal deviation of the various bars in the lower block of the IT8 card. Here we noted the maximum number of bars the scanner could distinctly identify.

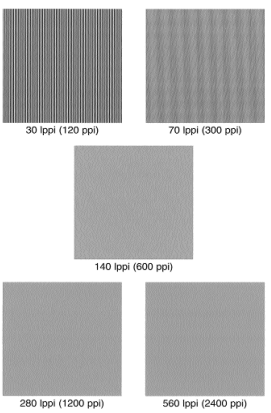


The IT8 card tests a scanner's ability to pick up tonal variations in dark, light and bright areas of an image

- **Photograph test:** A special glossy photograph was scanned at the highest optical resolution supported by the scanner. We compared the scanned image with the original photo for colour, overall smoothness of the image, realistic glossy effect as present in the original photograph, contrast, crispness in detail, etc.

The image used for the photo quality test

c) Resolution Test: To evaluate the resolution of each scanner we scanned a special document consisting of five patterned blocks in greyscale mode.



Each block contained closely packed lines with increasing density. The resolution of a scanner is judged by the number of distinct readings it can take per inch in each direction. Using Photoshop 6.01, we tried to select the individual lines present in the blocks. To differentiate between the lines, we used the Magic Wand tool in Photoshop.

The ability of the scanner to pick up closely packed lines in each of these blocks deteremines its resolution

Selecting individual lines in the blocks indicates the clarity with which the scanner can capture images. If Photoshop detects a solid block instead of the constituent lines, it indicates that the scanner cannot capture the finer details.

Warranty and support: Here we took into account the warranty period for the scanners, the number of authorised service centres appointed by the companies and the number of cities in which authorised service centres are present. The information was provided by the respective companies. The weightage allotted to this category was 10 per cent.

Value for money: This is a factor of the performance and features offered by the scanner as compared to its price. We computed this value by dividing the sum of a scanner's scores in the performance and features tests by its price. The weightage allotted to this category was 20 per cent.

How they fared

We found a wide variation in the performance and features offered by the scanners in each category. It was also quite surprising to note that some of the budget scanners actually out-performed most mid range scanners, while the high-end scanners were in a class of their own. What's obvious from our test results is that you can find the right scanner for any need depending on your budget.

Features

We looked for standard features such as the maximum resolution and colour depth supported, time-saving features such as one-touch scanning support, the bundled accessories and software and the quality of documentation and manuals provided.

Resolution: We gave primacy to optical resolution over interpolated resolution, which is the actual resolution that a scanner can support (this is a hardware limitation), but it can be interpolated to a much higher value using software. In the budget segment we found that all scanners supported at least a 600x1200 dpi resolution with the exception of the Agfa SnapScan 310P—it was the only scanner that offered a 300x600 dpi resolution. The BenQ and Mustek scanners had the best drivers—both supported a maximum interpolated resolution of 19200x19200 dpi.

Among the mid range scanners, the Umax scanners came out tops—the Astra 4400 and 5400 were the only scanners in this category to support an optical resolution of 1200x1200, but as observed in the budget category, the BenQ ScanPrisa 640BT and Mustek 1200ED had the highest interpolated resolution (19200x19200 dpi) in this category as well.

In the high-end segment, the HP ScanJet 5400C and 5470C supported a whopping 2400x2400 dpi optical resolution and infinite interpolated resolution. This was reflected in the scanned images, which were very crisp and realistic.

Interface: Almost every vendor in the budget segment has switched over to the USB interface since it provides a faster scanning speed and plug-and-play connectivity. The only exceptions were Agfa SnapScan 310P and Canon CanoScan N640P. Surprisingly no scanner supported the USB 2.0 interface.

The scenario was a little different for mid range scanners—four of seven scanners tested supported the USB interface (BenQ ScanPrisa 640BT, Microtek ScanMaker V6UPL, Umax Astra 4400 and Astra 5400). Agfa SnapScan 1212P and Mustek 1200ED were the only scanners that used the older and slower parallel interface, and Microtek ScanMaker X6EL was the only SCSI scanner in this segment.

In the high-end segment, the Epson Perfection 1650 and Umax Astra 4000U had only a USB interface. The two HP models also had a parallel interface, while Microtek ScanMaker X12USL had a SCSI interface along with USB. The only short-

Scanning a Scanner

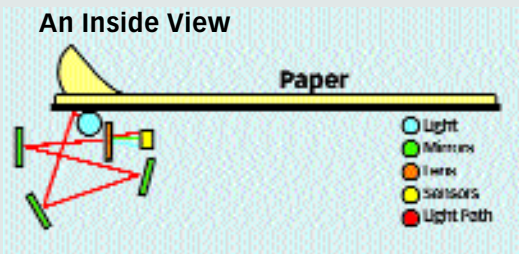
A scanner is a device that captures and converts images and documents to a digital format. It does so by using an array of photosensitive cells that detect light reflected off or transmitted through the object being scanned. This array of receptors, referred to as a charge-coupled device (CCD), measures light intensity and converts it into an electrical charge.

An analogue to digital converter (ADC) is required to digitise the information. Each cell in the CCD array then creates one pixel and for each pixel a certain number of bits is stored. The more bits of information assigned to each pixel, the better the image quality.

There are a few essential parts which go in the making of the scanner. These are:

CCD: The Charge Coupled Device is the heart of a scanner. It is made up of an array of photo diodes, which sense the light and convert it into an electrical signal.

Lamp: This is usually a cold cathode fluorescent lamp. It lights up the area to be scanned with pure white light, which is reflected back from the document and is captured by the CCD.



Scan head: This is the area which holds the CCD and the fluorescent lamp. The head assembly is mounted on the stabiliser bar, which moves from end-to-end while scanning.

Glass plate: This is where the document is placed. It is larger in size than the document (A3, A4) it supports. The scan quality depends a fair deal on the glass—if there is dirt over or under the glass, the scanned image will have artefacts and smudges.

Lens/mirror: The mirror reflects the light to the lens. There are usually two or three mirrors in a scanner. It is very critical for the placement of the mirror and the lens to be accurate so that all the light is concentrated on the CCD—otherwise some areas of the scanned image will be cut.

Stepper motor: The CCD, lamp, mirror and lens are all placed on the same head assembly. This assembly is moved by the stepper motor which takes its control signal from the circuitry placed at the bottom of the scanner.

An Automatic Document Feeder lets you feed a stack of pages for scanning without having to manually place each page in the scanner

coming for a SCSI scanner is its immobility from one machine to another, as it requires the PC to have a SCSI adapter.

Colour depth: As a rule, if you plan on getting a scanner for slides, negatives or transparencies, you need at least 30-bit colour depth, though 36-bit would be preferable. But if you intend to scan high resolution photographs then nothing less than 48-bit for colour and 16-bit for greyscale should do. Also make sure that the scanner supports upwards of 1200x1200 dpi resolutions.

Most of the scanners in the budget segment offered 48-bit colour depth. The exceptions were the Microtek ScanMaker 3730, Canon CanoScan D646U and CanoScan N640P (42-bit each) and the Agfa SnapScan 310P (30-bit). In the mid range section, all the scanners offered 36-bit or more colour depth, except the Mustek 1200ED, which offered a paltry colour depth of 30-bit. Microtek ScanMaker X12USL offered a bit depth of 42 bits, while the others in the high-end segment had a colour depth of 48 bits.

Ease of use: Features like Scan-to-Web, Fax, Email, Print and Copy allow even novice users to scan images without difficulty, as details regarding resolution and colour depth are handled by the TWAIN driver. For example, if you need a scanned image to be sent across to your sister in the US, you just press the Scan-to-Web button and the scanner scans at the resolution best suited for transferring it across the Net.

We found such features missing in many of the budget scanners. For example, the Agfa SnapScan 310P, the BenQ SW2 3300U and SW2 5000E, the Canon series and the Umax AstraSlim had no such buttons on them. The best of the lot here were the Microtek ScanMaker 3800 and the Mustek BearPaw 1200CU, which had all of these buttons.

In the mid range segment, the BenQ ScanPrisa 640BT and the Umax scanners had three buttons on their panel. No other manufacturer in this segment provided such easy-to-use buttons on their front panel.

Both HP scanners were clearly a step above the rest in the high-end category. The HP scanners had the four standard buttons for Copy, Email, Fax and Print plus you can also adjust brightness and contrast on the scanner.

Miscellaneous features and bundled accessories: Transparency adapters for scanning films and transparencies add greater functionality but also add to the cost of the scanner. Built-in transparency adapters were only available in three of the 23 scanners tested and that too only in the mid and high-end segment. In the mid range, the BenQ ScanPrisa 640BT was the only one with a bundled transparency adapter with support for 35 mm films, while the Umax Astra 4400 and Microtek X6EL had optional device connectors. Among the high-end scanners, Epson Perfection 1650 Photo had integrated transparency

With a Transparency Adapter you can scan negatives, slides, and transparencies

Jargon Buster

Artefacts and noise: Marks and smudges picked up in the course of scanning or data transfer that do not correspond to the original document. Artefacts might include pixellation, dotted lines, regularly repeated patterns, moiré, etc.

Batch scanning: Some scanners can automatically recognise several images placed on it and save them as separate files. Also, an automatic document feeder can be used to send pages one at a time to be scanned, saving a lot of time.

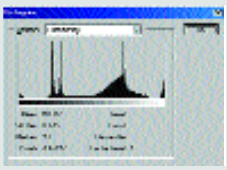
Bit depth: The scanner stores a certain number of bits of data for each pixel in an image: 1 bit represents two colours (black and white). Similarly, 2 bits represent four colours—black, two shades of grey and white. The higher the number of bits devoted for this (bit depth), the better the scanner is at distinguishing between really close shades of the same colour. This results in better image quality.

Contrast: Contrast determines the gap between the darkest shade and lightest shade (in effect the number of shades actually used in an image). An image with low contrast tends to look lifeless and flat.

CCD array: Known as Charge Coupled Device array, this is a set of light-sensitive diodes used in scanners and digital cameras. It sweeps across a document during capture and, when exposed to light, generates a series of digital signals that are converted into pixel values.

Halftone: Most printing processes are not capable of printing continuous tone images. Hence, dots of varying size or density are used to give the impression of grey areas in a greyscale image.

Histogram: An imaging tool that shows how pixels are distributed by tonal value in an image. Each grey level in a greyscale image has a vertical line that shows the number of pixels. Usually, a histogram shows low values (dark parts of the images) on the left, climbing to the highest and lightest on the right. A histogram is a useful method for checking that you have a good scan, with a full range of colours.



The histogram function in Photoshop

Hue and saturation: The aspect of colour that distinguishes it from another colour (what makes a colour red or green or blue). Hue is distinct from saturation, which measures the intensity of the hue (more red, more green, etc).

Midtones: An image is logically divided into highlights (bright areas), midtones (medium-bright areas) and shadows (dark areas). If converted to greyscale, midtones correspond to 50 per cent grey.

Resolution: The resolution, measured in dots or pixels per inch (dpi or ppi), defines the ability of an imaging device to capture or display individual dots or picture elements (pixels). There are two types of resolution: optical and interpolated, of which the first is more important. More pixels mean better resolution and sharper image quality. The resolution can be increased to capture finer details, but after a point, added resolution will not result in an appreciable gain in image quality but only results in a larger file size.

Tonal range: Also called the dynamic range or the optical density (OD) of a scanner, it is a measure of how well the scanner can capture the gradations from bright highlights to dark shadows in an image.

TWAIN: It is a software industry standard that allows TWAIN-compliant applications and scanners to communicate. It allows the scanner to be accessed from within another program, for example an image editing or DTP application.

adapters for both 35 mm and wide format films, used largely by professionals. HP ScanJet 5400C only had the interface for attaching the adapter, whereas its elder sibling the HP ScanJet 5470C had the adapter too.

Power saving is another critical feature—if the CCF (cold cathode fluorescent) tube is not in use for a specified period, the scanner shuts off automatically. This not only saves power but also enhances the life of the CCF. In the Budget range, only three scanners—BenQ SW2 4300U, SW2 5000E and Umax AstraSlim 600—had this feature. Among the mid range scanners, only Agfa SnapScan 1212P and Mustek 1200ED did not have provision for power saving, while all the scanners in the high-end category possessed power saving features.

Epson Perfection 1650 Photo offers the maximum number of features from one-touch controls to excellent bundled software and even a transparency adapter

A transport lock protects the scanner from damage during transporting. In the budget range all three BenQ scanners, the two Canon scanners and the Microtek ScanMaker 3800 had the transport lock feature. In the mid range, the transport lock feature was available only in two models—BenQ ScanPrisa 640BT and Microtek Scanmaker X6EL. Among high-end scanners, the transport lock was missing only in the Umax Astra 4000U.

A removable lid becomes an important consideration if you need to scan images from thick magazines or books, as its absence would adversely affect the quality of the scanned images. Among the budget scanners, only the Microtek ScanMaker 3800 and 3730 sported this feature. In the mid range segment again only the Microtek series and the Umax Astra 5400 supported the removable lid feature. In the high-end segment, all five scanners had support for removable lids—not surprising as these scanners are used by professionals who need to scan from a variety of source documents.

Overall: In the budget category, Microtek Scanmaker 3800 came out to be the clear winner with an aggregate of 18 points, edging out its nearest rival, the BenQ 4300U. Canon CanoScan D646U had the lowest score for features here, managing only 10.75 points, mainly because its driver did not support a majority of the functions for image enhancement, nor did it have one-touch control buttons for easier scanning.

In the mid range segment, Microtek's ScanMaker X6EL scraped in as a winner with just one point more than its nearest rivals, BenQ ScanPrisa 640BT and Umax Astra 5400. It scored higher mainly because of its support for legal paper size—a feature which will be appreciated by lawyers and tax consultants. The Mustek 1200ED could only manage

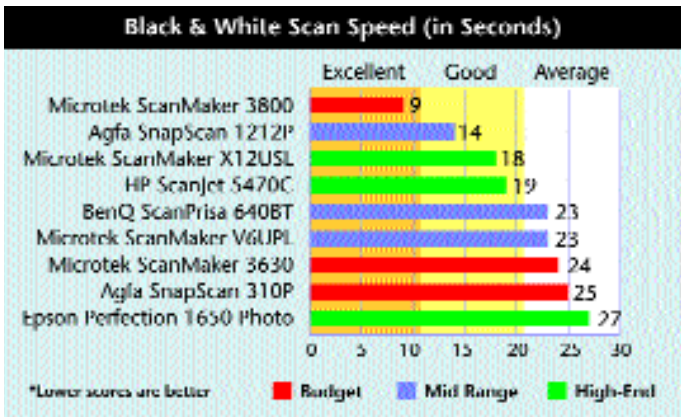
9.25, which was incidentally also the lowest score across all categories.

In the high-end segment, the Epson Perfection 1650 came out the winner with a score of 24.5 points, which is over 4 points higher than its nearest competitor, HP ScanJet 5470. The Perfection 1650 is feature-rich, has a detailed user manual as well as a detailed troubleshooting guide. The only two mising features are support for batch scanning and network scanning. The Umax Astra 4000U scored a decent 19.5, but even though it supported network and batch scanning—features that are not common—it fell short as its TWAIN driver didn't offer too many enhanced imaging features.

Performance

A scanner's performance is judged by the quality of the image and the speed at which it is capable of scanning. Whether you should consider speed or quality when buying a scanner will depend on how you plan to use it. If you need to scan in large volumes, the speed should rate higher, but if you need scans for presentations, professional level imaging or printing, the quality of the image is more critical. In fact, if a scanner gives you great quality, you can consider compromising a little on speed.

Black and white scan speed: On an average, we found that most budget scanners took about 30 seconds to scan a black and white text document. The scanner that really stood out here was the Microtek ScanMaker 3800, finishing the scan in a blazing 9 seconds! No other scanner came even close to breaking the 20-second barrier in the budget range. The closest that came to it were



the Microtek ScanMaker 3630 and the Agfa SnapScan 310P—both finished the scan in just under 25 seconds. The slower ones, except for the Canon series of scanners, took between 25 to 30 seconds, which is quite tolerable. The Canon CanoScan N640P was by far the slowest in the entire comparison test—it took over a minute (65 seconds) to finish scanning the document. We ran the test several times but got the same result each time.

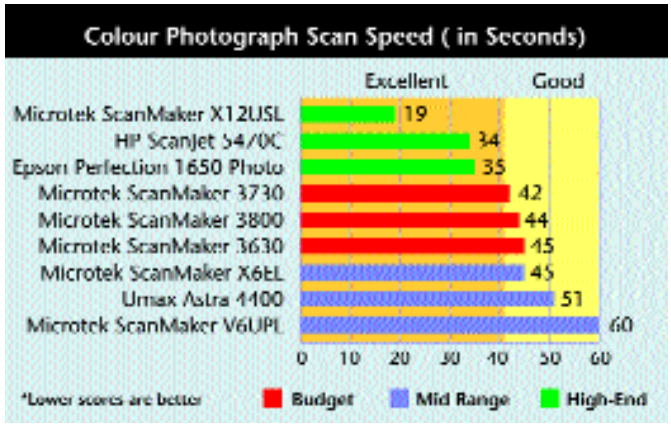
One would expect the scanning speeds to improve as you move up the price ladder, but this was not the case. Also, scanning black and white documents at 300 dpi should hardly tax a scanner, regardless of whether the scanner has a SCSI, USB or parallel interface—there is hardly enough data to put the interface, scanning engine or the TWAIN driver under any pressure. This fact was brought home in the mid range section: Agfa SnapScan 1212P, which uses a parallel interface, finished scanning the document in just under 14 seconds. On the other hand, Microtek ScanMaker

Speed Tests
Comparing scanner speeds is tricky as the speed of scanning depends on the speed of the scan engine and some of it depends on the scanner's interface with the PC.

X6EL, which is basically a SCSI scanner, took all of 41 seconds. The slowest scanner here was the Umax Astra 5400, a USB scanner; it took almost 46 seconds to scan the simple black and white document!

ScanMaker X12USL from Microtek took top honours in the high-end segment. It uses a SCSI interface and finished scanning the document in a neat 18 seconds. It was followed closely by the HP ScanJet 5470C, a USB scanner, which took a decent 19 seconds to scan the document. The rest took over 25 seconds, with the Umax Astra 4000U being the slowest—it took 37 seconds to finish the test.

So if you have tonnes of documents to scan, there is only one choice—the Microtek ScanMaker 3800. By the time you pick up the next page to scan, you will have the previous document scanned and ready to use!



Colour photo prescan speed: Most people preview a full photograph, crop it, select the areas they want and then scan it. This makes the time taken to preview very important, especially if you scan a truckload of photographs and graphically intensive documents. The scores in this test were quite varied and the preview times ranged from under 10 seconds to about 30-odd seconds. Ideally, a 10 second preview is what you should look for when scanning a photograph.

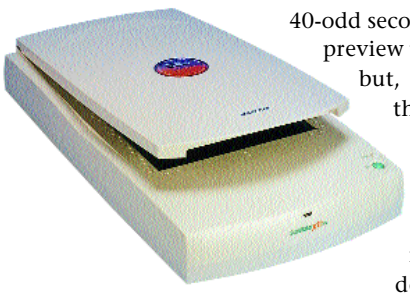
Most of the budget scanners took less than 20 seconds to preview. The Microtek ScanMaker 3800 performed well in this test too, taking 9 seconds to preview the photograph, but was surprisingly beaten by the Agfa SnapScan 310P, which came out with top honours here, taking 8 seconds to preview the photograph.

The scanners in the mid range segment were quite sluggish—not one scanner could break the 10 second barrier. The best times were logged by BenQ ScanPrisa 640BT (12 seconds) and the Umax Astra 4400 (13 seconds). The Microtek ScanMaker V6UPL was the slowest here, taking 32 seconds to finish the preview.

The high-end scanners got to show off their mettle in this test—the HP ScanJet 5470C and ScanJet 5400C finished the photo preview in 8 seconds flat. The slowest scanner here was the Umax Astra 4000U at a disappointing 25 seconds.

Colour photo scan speed: This is where speed really counts. Scanning full colour documents or photographs can really put the scanner, its interface and the TWAIN driver under severe stress. Besides, as most users buy a scanner to scan photographs, the time taken for this test becomes an important consideration.

We scanned a colour photograph at 300 dpi, and under ideal circumstances it should take not more than 40-odd seconds (multiplier of 4 on the preview time) to complete this test, but, on an average, we found the scanners taking about a minute.



Microtek ScanMaker X12USL offers blazing fast colour photo scanning speeds—our test photograph was scanned in an amazing 19 seconds!

A scanner with a faster interface such as SCSI or USB should be faster. This was clearly evident in the budget segment where the USB scanner from Canon (the CanoScan D646U) was significantly faster than its parallel port sibling, the Canon CanoScan N640P. The N640P took nearly 200 seconds (3 minutes 20 seconds) to scan the photograph, while the D646U took only 56 seconds, making it nearly three-and-a-half times as fast! For heavy scanning, a parallel interface truly becomes a bottleneck. The USB scanners on the other hand consistently logged a time of around 60 seconds. The Microtek ScanMaker 3730 was the fastest here, taking just 42 seconds to scan the colour photo. In fact, all the Microtek entries in the budget segment performed exceptionally well, taking around 40-45 seconds. The slowest USB scanner here was the Umax AstraSlim 600—it took over a minute-and-a-half to complete the test.

Once again, the scanners represented in the mid range segment did not live up to their price points. They were much slower than the budget 'speedos' and only the Microtek ScanMaker X6EL, a SCSI scanner, showed some promise by finishing the scan in 45 seconds. The rest turtled in at over a minute at an average.

The high-end segment proved to be quite exciting, with the photo being scanned at warp speeds! The Microtek ScanMaker X12USL was a true speed demon taking just 19 seconds to scan the photograph! The Microtek scanners performed well in the speed tests across segments, but this one truly takes the cake. With such scanning speed, you needn't even preview the photograph before scanning! Almost all the scanners finished the scanning in under our 40 second speed limit in this test, except for the Umax Astra 4000U which was surprisingly slow and took over a minute to scan the photograph.

This is the first time we've seen a test segment being completely dominated by a brand. Microtek seems to have gotten all the elements right when it comes to high speed scanning. Their scanners proved to be unbeatable across categories and are highly recommended for bulk scanning.

IT8 card test: Tonal quality is measured on a logarithmic (exponential) scale ranging from pure white to pure black. The tonal range is the difference between the darkest and the brightest optical densities (shades) a scanner can capture. The bigger the difference, the larger the dynamic range of the shades it can capture and hence better the scanner's image reproduction ability. The ability of a scanner to detect a wider tonal range is inherent in its hardware. A scanner that can detect sublime tonal variations needs to be built solidly from the bottom up. No amount of driver tweaking will make up for any build quality flaws.

Smooth Scanning Tips

■ **Selecting scanning area:** Always preview the document and select just the area to be scanned, instead of scanning the full document. This will reduce the scanning time as well as the file size, especially when scanning at high resolutions.

■ **Resist scanning at high resolutions:** If you intend to scan your documents only to view them onscreen, scanning at a resolution between 100-150 dpi is enough as monitors can only display 72 dots per inch (dpi). Scanning documents at higher resolutions will only result in a larger file size. If you are scanning a document for faxing or OCR-ing, 200-300 dpi is sufficient and for printing photos, 300-600 dpi is fine. For photo scanning, keep the setting at the maximum colour depth that your scanner supports.

■ **Use Descreen:** When you scan content from magazines or newspapers, you will notice a lot of moiré (converging and diverging lines) on the scanned image. The best way to reduce this pattern is to use the Descreen option in the scanner software. If your scanner software does not have a Descreen option, you can use an image editing software.

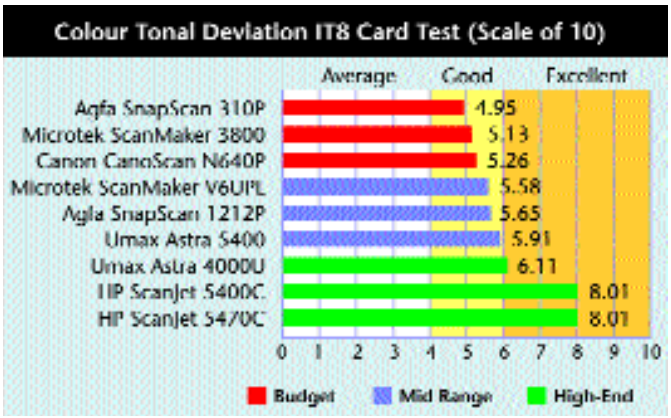
■ **Image format:** Select an image format depending on where you will be using the image. If you will be using it for the Web or for animation, save it in JPEG or GIF—these compressed formats save a lot of hard disk space. On the other hand, if you are scanning the image for print, TIFF is the best format as it compresses the image without loss in image quality.

■ **Correct ghost images:** A ghost image occurs when the scanner picks up images from the back of the page. This can usually be corrected by changing the darkness and contrast settings. Experiment to find the best settings for your scanner. Another simple way to correct this is to place a thick white paper over the document being scanned.

■ **Adjust brightness, contrast and sharpness:** Many a times the scanned image turns out to be dull. This can be easily fixed through the TWAIN driver (if your scanner supports it) or through the image editing software where you can adjust the contrast and brightness levels.

In the greyscale tonal deviation test, there are 22 distinctly shaded bars. The last four bars have very minor differences in shade, and it is a big feat for a scanner to pick up these differences. Hence, a score of 18 should be considered quite acceptable, whereas a score of 20 and above would be exceptional. In the colour tonal deviation test, a combined weighted score of about 4 points out of 10 for the dark, mid and light zones should be considered acceptable. The variations in colour in the dark and the mid zones are relatively easy to achieve but most scanners cannot pick up the variations in the light coloured areas. Here, if a scanner scores more than 5 points, it means that it has decent capabilities to capture tonal variations. It is rare to find a scanner that can manage all three zones without trouble—such scanners will achieve a combined weighted score of over 6 points.

In the greyscale tonal deviation test, all the scanners in the budget segment detected at least 18 of the 22 shades. The Microtek ScanMaker 3800 detected 21 bars. No other scanner in this category could match that score, but the Agfa SnapScan 310P, Canon CanoScan N640P and the Microtek ScanMaker 3630 did manage to detect 20 bars each. In the colour deviation test, most budget scanners crossed 4 points. Only the Canon CanoScan N640P and



the Microtek ScanMaker 3800 could go beyond 5—they scored 5.26 and 5.13 respectively.

The mid range segment proved to be a mixed bag. While the Mustek 1200ED and the Microtek ScanMaker X6EL scored below 18 in the greyscale deviation test (17 and 16 respectively), the rest detected more than 18 bars. The Agfa SnapScan 1212P, Microtek ScanMaker V6UPL and Umax Astra 4400 scored 21 each. These three scanners did well in the colour deviation test too, scoring over 5 points. Surprisingly, the Umax Astra 5400 took top honours in the colour deviation test, scoring a healthy 5.91. The Astra 5400 has been quite an underperforming scanner, with its younger sibling, the Umax Astra 4400, trouncing it in almost all the performance tests.

All the scanners in the high-end segment detected over 20 bars in the greyscale tonal deviation test. The HP ScanJet 5470C and the Microtek ScanMaker X12USL stood out by detecting 21 bars each. But the colour deviation test was where these big boys got to show their real muscle. Scoring 5 was not a problem for these scanners, but the real champions were the HP ScanJet series of scanners—the 5400C and the 5470C scored an impressive 8.01 each. A scanner that can replicate such sublime variations in tone as seen on an IT8 card speaks a lot about the quality of its scan engine.

Colour photo scan quality: This is a test where bit depth matters the most. You need a minimum bit depth of 24 bits for decent image quality. A certain loss or distortion of information is inherent in the scanning process. This is commonly referred to as noise or artefacting. In reality, artefacting cuts a standard 24-bit depth to around 16, which directly decreases the number of colours represented and hence the quality of the scanned image suffers.

The technically inclined may wonder that a monitor can display only 24 bits of colour data, so what happens to a 48-bit scan? Well, the answer is simple: with more information in each pixel, the image has smoother colour gradations and a much improved overall image colour reproduction.

The quality of the scanned photo in the budget scanners was pretty average. This could be directly attributed to the lower resolutions that these scanners support. A score of 5 out of 10 should be considered fairly average. The highlights and shadows of the photo were more subdued and one could distinctly observe jagged edges in parts of the image. Artefacting was also fairly pronounced—we found about five to eight white patches (artefacts) with these scanners. The best scores were logged by the Agfa SnapScan 310P and the Mustek BearPaw 1200CU (6.79 points each). Their scanned images had almost zero artefacting, the colours were smooth and the edges sharp. The Agfa SnapScan 310P scores are quite astonishing—this scanner has

Scanner Calibration

Colour calibrating your scanner can go a long way towards ensuring that what you scan, what you see on screen and what you print look the same.

Basic visual calibration: The first step is to calibrate your monitor. The next step is to scan something and make adjustments using a gamma correction tool like Adobe Gamma until the colours on the scanned image on your monitor and the actual photograph match.

Adjust gamma settings for optimal colour matching

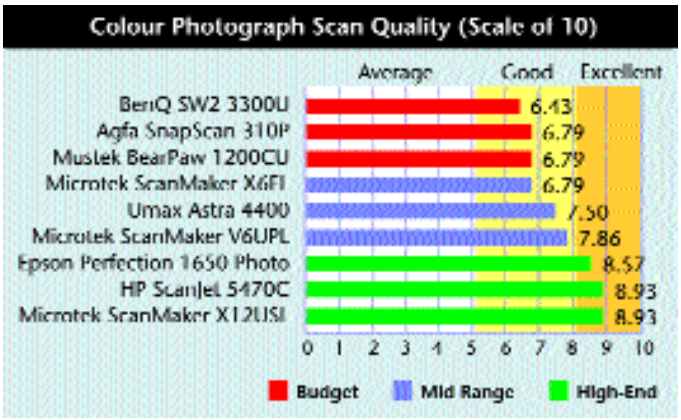
Use any high-quality photographic image with a wide range of tonal values. Ensure that before scanning, all automatic colour correction is turned off. After scanning, adjust the controls from within your scanning software and rescan until what you scan matches your monitor display. Note all adjustments and save them as a profile for future use.

Colour calibration with ICC profiles: ICC profiles provide a more thorough way to ensure consistent colour. These files are specific to each device on your system and contain information about how that device produces colour. If your scanner comes with a pre-made colour profile for your scanner model, use it—it may give better results than manual calibration.

Colour calibration using an IT8 card: Calibration or profiling software may come with an IT8 scanner target—a printed card that includes photographic images, greyscale bars and different colour bars. Different manufacturers have their own IT8 cards, but they all generally conform to the same standard for colour representation. The IT8 card requires a digital reference file (colour profile) specific to that image. However, some scanners come with pre-defined profiles; in order to accurately calibrate your scanner you will require profiling software that comes bundled with the IT8 card.

First scan the IT8 card. The scanned image will be an RGB image; change it to Lab colour (this can be done using a calibration software such as Color Blind Matchbox). Now compare the lab values of the scanned patches on the IT8 card with the values in the digital reference file of the IT8 card. The software can now calculate your input system's colour error for each patch. The software will use this information to build a corrective colour table. This table and its supporting information can be saved as a colour profile.

Preferably, calibrate your scanner every month, depending on how much you use your scanner. If you make changes to your software or hardware, it may be necessary to re-calibrate.



a rated colour scan depth of 30 bits and a greyscale scan depth of 10 bits, but it beats scanners rated at 48 bits!

In the mid range segment, the Microtek ScanMaker V6UPL scored an amazing 7.86 followed closely by the Umax Astra 4400, which scored a nifty 7.50. The Umax Astra 4400 unlike its sibling, the Umax Astra 5400, has consistently shown better performance—it's a little slow in scanning speeds, but is up there with the best when it comes to scan quality.

Scores of 8 out of 10 were quite common in the high-end segment with crisp reproduction of colours, sharp rendition of edges and excellent contrast. The HP ScanJet 5470C and Microtek X12USL scored an impressive 8.93 each—the scanned images were so beautiful that the original photograph itself looked a bit jaded. A complete surprise here was the Epson Perfection 1650. So far, its performance ranged between average to decent, but in this test it scores a brilliant 8.57.

Resolution test: When comparing the listed resolutions, always consider the smaller number, which denotes the optical resolution. If you need to pick up fine details, small fonts or complex lines and fine edges, you will need more optical resolution. The number of pixels a scanner can generate is based on how many CCDs are arranged horizontally and vertically in the scan head. Resolution is quoted both horizontally and vertically (for example, 300x600 denotes 300 pixels horizontally and 600 vertically).

All of this is theory. In practice, the ability of a scanner to actually capture as much data as possible depends on a variety of factors. A score of 3 out of 5 is acceptable here.

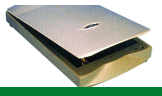
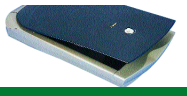
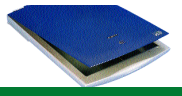
The budget scanners scored pretty decently in this test, with almost all of them scoring 3 out of 5. Most of them listed a resolution of 600x1200 dpi and were able to catch the finer details. Even the Agfa SnapScan 310P, which has a pretty low listed optical resolution of 300x600, scored a decent 3 points. The scanners that failed to impress here were the Microtek ScanMaker 3630 and the Umax AstraSlim 600, both scoring 2 points, even though they support a decent optical resolution of 600x1200.

Only two scanners in the mid range segment had support for optical resolutions higher than 600x1200. The Umax Astra 4400 and the 5400 support an impressive optical resolution of 1200x2400 and 1200x1200, respectively. This higher resolution directly translated into an impressive scan of the resolution bars—both detected four of the five bars in this test. Amongst the scanners with a rated resolution of 600x1200, only the Agfa SnapScan 1212P could manage 4 points; the rest were stuck at 3.

Among the high-end scanners, the HP ScanJet 5400C and 5470C had a very high rated resolution of 2400x2400. We expect-

SCORE BOARD



CATEGORY	BUDGET (UP TO RS 6,000)					
	Agfa SnapScan 310P	**BenQ SW2 3300U**	**BenQ SW2 4300U**	**BenQ SW2 5000E**	**Canon CanoScan D646U**	**Canon CanoScan N640P**
Features						
Scanner Specifications						
Physicial Dimensions (WxDxH, in cms)	33 x 44.5 x 10.5	25.8 x 73 x 4.2	25.8 x 73 x 4.2	25.8 x 73 x 4.2	25.7 x 43.1 x 6.1	25.6 x 37.5 x 3.9
Weight (Kg)	3.8	2.1	2.1	2.1	2	1.5
Interface (Parallel, USB, SCSI, MAC, IEEE 1394)	Parallel	USB	USB	USB	USB	Parallel
Max Resolution (Optical, Interpolated)	300 x 600, 4800 x 4800	600 x 1200, 19200 x 19200	600 x 1200, 19200 x 19200	1200 x 2400, 19200 x 19200	600 x 1200, 9600 x 9600	600 x 1200, 9600 x 9600
Colour, Grey Scan Depth (bits)	30, 10	48, 16	48, 16	48, 16	42, 14	42, 14
Document Scan Area*	A4	A4	A4	A4	A4	A4
One-touch Controls (Scan to Fax, Print, E-mail, Copy)	✗ ✗ ✗ ✗	✗ ✗ ✗ ✗	✓ ✗ ✓ ✓	✗ ✗ ✗ ✗	✗ ✗ ✗ ✗	✗ ✗ ✗ ✗
Removable Lid	✗	✗	✗	✗	✗	✗
Transport Lock	✗	✓	✓	✓	✓	✓
Busy LED indicator	✓	✗	✓	✗	✓	✗
Power Saving mode	✗	✗	✓	✓	✗	✗
Bundled Accessories						
Transparency Adapter	✗	✗	✗	✗	✗	✗
Cables and Adapters	Parallel cable, Power adapter	USB cable, Power adapter	USB cable, Power adapter	USB cable, Power adapter	USB cable, Power adapter	Parallel cable, Power adapter
Bundled Software	OmniPage LE, MicroFrontier Colour It, Ulead PhotoExpress	ABBYY FineReader Sprint, Ulead PhotoExpress	ArcSoft PhotoImpression, ArcSoft PhotoBase, ABBYY FineReader Sprint	ArcSoft PhotoImpression, ArcSoft PhotoBase, ABBYY FineReader Sprint	ArcSoft PhotoStudio 2000, ScanSoft OmniPage Pro 9.0	ArcSoft PhotoStudio 2000, ScanSoft OmniPage Pro 9.0
Software/Driver Features						
Scaling (1% to 200%)	✓	✓	✓	✓	✓	✓
Shadows / Halftones / Highlights Adjustment	✓	✓	✓	✓	✗	✗
In-built Colour Matching	✗	✓	✓	✓	✗	✓
Gamma Corrections	✓	✓	✓	✓	✓	✓
Downloadable Gamma Curves	✗	✗	✗	✗	✗	✗
Error Diffusion	✗	✗	✗	✗	✗	✗
Effect Filters	✗	✓	✓	✓	✗	✓
Batch Scan Capability	✗	✗	✗	✗	✗	✗
Network Scanning Support	✗	✗	✗	✗	✗	✓
Manual & Documentation						
Listing of Specifications	✗	✗	✗	✗	✓	✓
Quick Setup Guide	✓	✓	✓	✓	✓	✓
Troubleshooting	✓	✗	✗	✗	✗	✗
Contact Information for After Sales Support	✓	✗	✗	✗	✗	✗
Performance						
Speed Tests (in seconds)						
Black & White Text	25	30	29	33	50	65
Greyscale Photo Scan	25	28	29	34	47	67
Full Colour Photo Prescan (preview mode)	8	13	13	10	17	22
Full Colour Photo Scan	107	59	58	65	56	199
Quality Tests						
IT8 Card Test						
Greyscale Tonal Deviation (Out of 22 bars)	20	18	18	19	19	20
Colour Tonal Deviation (Scale of 10)	4.95	4.46	4.20	4.84	4.84	5.26
Photograph Test (Scale of 10)	6.79	6.43	6.43	5.71	5.71	6.07
Resolution Test (Scale of 5)	3	3	3	3	3	3
Warranty & Support						
Number of Authorised Service Centres	9	16	16	16	60	60
Number of Cities where Service Centres are Present	3	16	16	16	27	27
Period of Warranty (Years)	1	1	1	1	1	1
Overall Score						
Features (30%)	14.25	14	17	13	10.75	12.75
Performance (40%)	28.99	28.20	27.97	29.37	26.61	26.61
Warranty & Support (10%)	5	6	6	6	6	6
Value for Money (20%)	13.10	18.03	17.33	11.77	13.85	16.42
Overall Product Rating	61.35	66.23	68.30	60.14	57.21	61.78
Overall Grade	B	B+	A-	B	B	B
Vendor Name	Manoj Trading Corp.	BenQ India Pvt. Ltd.	BenQ India Pvt. Ltd.	BenQ India Pvt. Ltd.	Canon India Ltd.	Canon India Ltd.
Phone	022-2083541	022-5705230	022-5705230	022-5705230	011-6806572	011-6806572
E-mail	benganis@bol.net.in	pankajpamani@benq.com	pankajpamani@benq.com	pankajpamani@benq.com	brijesh.verma@canon.co.in	brijesh.verma@canon.co.in
Price (In Rupees)	5,500	3,900	4,325	6,000	4,495	3,995

* *A4 equals 8.27"x11.69", Legal equals 8.5"x14"*

Scanner Maintenance

General maintenance

■ Place your scanner away from heating vents or windows, or other locations where moisture might affect its functioning.

■ Always keep the scanner on a level surface so that it gets a good grip, otherwise the mechanism carrying the CCD and fluorescent lamp will get damaged over a period of time.

Cleaning your scanner

■ If you find that the images you are scanning are marred with artefacts, light or dark stripes or a chequered board pattern, its time you cleaned your scanner glass. Unplug the scanner and raise the front lid. Apply a very mild streak-free cleaner to a soft lint-free cloth and clean the glass. Never use abrasives, Isopropyl alcohol, benzene or acetone on the scanner glass as this will streak and cloud the glass and can even cause damage. Wipe the glass dry with a soft cloth; wait until it completely dries out. If you find that the glass is dirty underneath, on the inside, do not unscrew the lid to clean it. Instead, call the authorised service centre to get it cleaned.

Moving a scanner

■ When transporting a scanner, ensure that the transportation lock is enabled as this prevents the CCD array mechanism tray from moving. To activate the lock, turn off the scanner and push down the lock, which is located at the back of the scanner. Remember to unlock the scanner before you attempt to operate it, else you may end up damaging it.

ed them to return a perfect 5 in this test, but were disappointed as the HP ScanJet 5400C managed only 3 points, with the rest of the high-end scanners scoring 4.

Warranty and support

Not one manufacturer provided a repair warranty for more than one year. Providing a large service network and support across cities helps to a certain extent but the lack of a three-year repair warranty is hard to justify.

HP has the largest service network in this country—it claims to have over 230 service centres across 79 Indian cities. It provides a carry-in warranty on its scanners and the best thing is that a scanner will be replaced or repaired within 48 hours. With such a wide network you generally wouldn't face a problem getting your scanner serviced.

What it all leads to...

Whether you need a scanner for professional use, or simply for scanning your personal photos at home, there's a wide range of scanners available in the market, catering to a cross-section of needs. Here are the best of the lot in performance as well as value for money.

Budget scanners: Despite a price cap of Rs 6,000, we received 11 scanners in this segment. Competition was fierce but there is little doubt about who wins the Best Performance Award—the **Microtek ScanMaker 3800** is probably the best scanner you can purchase for under Rs 6,000. It has a good set of features and returned consistently good performance in our speed and quality tests. It had the fastest black and white text scanning speed and passed the IT8 card test with flying colours. The Best Value Award goes to **BenQ SW2 3300U**. Its scores are pretty average, but with a price tag of Rs 3,900 there is little that one could complain about—it is a 'no-frills-no-thrills' scanner at a rock bottom price. Nonetheless, it gets the job done and is ideal for users who don't care what shade of red the scanner really scans!

Mid range scanners: We received seven scanners in this segment. The **Umax Astra 4400** won the Best Performance Award—its performance in the quality tests was exceptional. With great photograph scan capabilities, a high dynamic range (colour and greyscale) and excellent support for high resolution scanning, this scanner is a tough one to beat. The **Agfa SnapScan 1212P** bagged the Best Value Award. It costs just Rs 6,500 but offers a good balance of performance and features, with our only gripe being that it uses a parallel port.

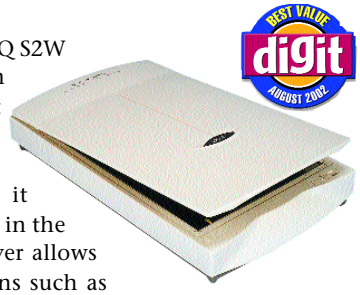
High-end scanners: These scanners represent the true pocket pinchers, performance demons and feature-packed monsters. They are targeted at professionals, imaging studios, design houses and corporates. The **HP ScanJet 5470C** won the Best Performance Award. It can scan photographs without artefacts or noise at high resolutions (supports 2400x2400 dpi) and has excellent colour reproduction capabilities. The Best Value Award was taken by the **HP ScanJet 5400C**. It too supports a 2400x2400 dpi resolution but is almost Rs 5,000 cheaper than the 5470C. Though it scores really well in the photo quality and colour tone tests, it performed below par in our resolution test.

The Winners!

Microtek ScanMaker 3800: The ScanMaker 3800 from Microtek is equipped with five one-touch buttons which make the task of scanning very simple. It is capable of scanning at 600x1200 dpi at 48-bit colour depth and sports a USB interface. This budget scanner performed exceptionally well in all the speed tests and gave the mid range scanners a run for their money. It comes bundled with Adobe Photoshop LE and Adobe PhotoDeluxe for editing the scanned images and ABBYY FineReader Sprint OCR to convert your valuable information into editable digitised formats. The scanner is priced at Rs 5,500, which makes it a little pricey for its category, but given the performance, it's worth the price.

Microtek ScanMaker 3800: the best possible combination of speed and quality

BenQ S2W 3300U: The BenQ S2W 3300U has a rated resolution of 600x1200 dpi with 48-bit colour depth and works using a USB interface. Though not the fastest, it returned pretty decent scores in the benchmarks. Its TWAIN driver allows you to make basic corrections such as adjusting highlights and gamma from within the interface itself. Priced at Rs



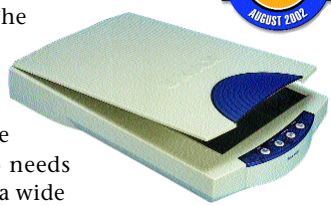
BenQ S2W 3300U: its price is irresistible

Decision Maker

	Entry-level scanner	Good balance of scan speed and quality	Super fast speed; excellent quality
You need	To scan documents and photographs occasionally. Quality is not that important	To scan photographs at decent resolutions along with coloured documents and magazine pages	Very high resolution scans which can be used for professional purposes (studios, media houses, etc) and has all features to tweak the image from within the driver
Look for	A minimum optical resolution of 600 dpi and support for 36-bit colour	An optical resolution of 1200 dpi and 48-bit colour depth and one-touch buttons to save time	An optical resolution of 2400 dpi and 48-bit colour depth. The scanner should be bundled with image editing and OCR software
Our pick	Microtek ScanMaker 3800 BenQ SW2 3300U BenQ SW2 4300U	Umax Astra 4400 Microtek ScanMaker V6UPL BenQ ScanPrisa 640BT	HP ScanJet 5470C HP ScanJet 5400C Epson Perfection 1650 Photo
Price range	Rs 4,000 to Rs 5,500	Rs 8,500 to Rs 9,000	Rs 13,000 to Rs 19,000

3,900, it is the cheapest scanner in this comparison test and is an affordable option for those looking for a decent mixture of performance and features at a rock-bottom price.

Umax Astra 4400: The Umax Astra 4400 has a rated resolution of 1200x2400 dpi and 48-bit colour depth. There are three one-touch buttons on the front-panel. The scanner wasn't the fastest but gave good results in the IT8 card test and resolution chart test. It is an excellent buy for the professional or someone who needs good colour reproduction and a wide tonal range, as well as for general office use where it will be used by multiple users—its driver has support for network scanning. The scanner is priced at Rs 8,950 but its top-notch performance makes it worth the price.



Umax Astra 4400: an excellent choice for the professional user

Agfa SnapScan 1212P: Agfa SnapScan 1212P sports an optical resolution of 600x1200 dpi and a 36-bit colour depth. Despite using a parallel interface, it was faster at scanning black and white documents than the SCSI and USB scanners in its category and also did quite well in the quality tests. Bundled with the scanner are Corel Print House, PageKeeper, OmniPage LE OCR software and MicroFrontier Colour It—software that will take care of all your imaging, printing and OCR tasks. The scanner is available for just Rs 6,500 which makes it the cheapest in its category.

Agfa SnapScan 1212P: more than adequate for your day-to-day scanning requirements

HP ScanJet 5470C: This sleek scanner's front panel is loaded with buttons which make it very easy to scan in bulk—you won't have to wait for the image application to open for the scanning job to start. The 5470C has a rated resolution of 2400x2400 dpi and 48-bit colour depth. The package includes HP Precisionscan Pro, which is a very good colour calibrating utility, and Readiris, an OCR software. The scanner costs a hefty Rs 17,999, but the price can be easily justified given the performance, bundled software and HP's service network.

HP ScanJet 5470C: every professional's dream

HP ScanJet 5400C: The HP ScanJet 5400C is capable of scanning documents at an optical resolution of 2400x2400 dpi and 48-bit colour depth. The scanner has 11 buttons on the front panel and you can even set the number of copies you want using the + and – buttons. The 5400C was neck and neck throughout our tests with its sibling, the ScanJet 5470C—the difference being that this model is available for Rs 12,999, which makes it an affordable scanner for those looking for a 2400 dpi scanning solution. Couple this with its long list of software and it would be tough for you find a better deal.

HP ScanJet 5400C: a great combination of features and performance at an affordable price

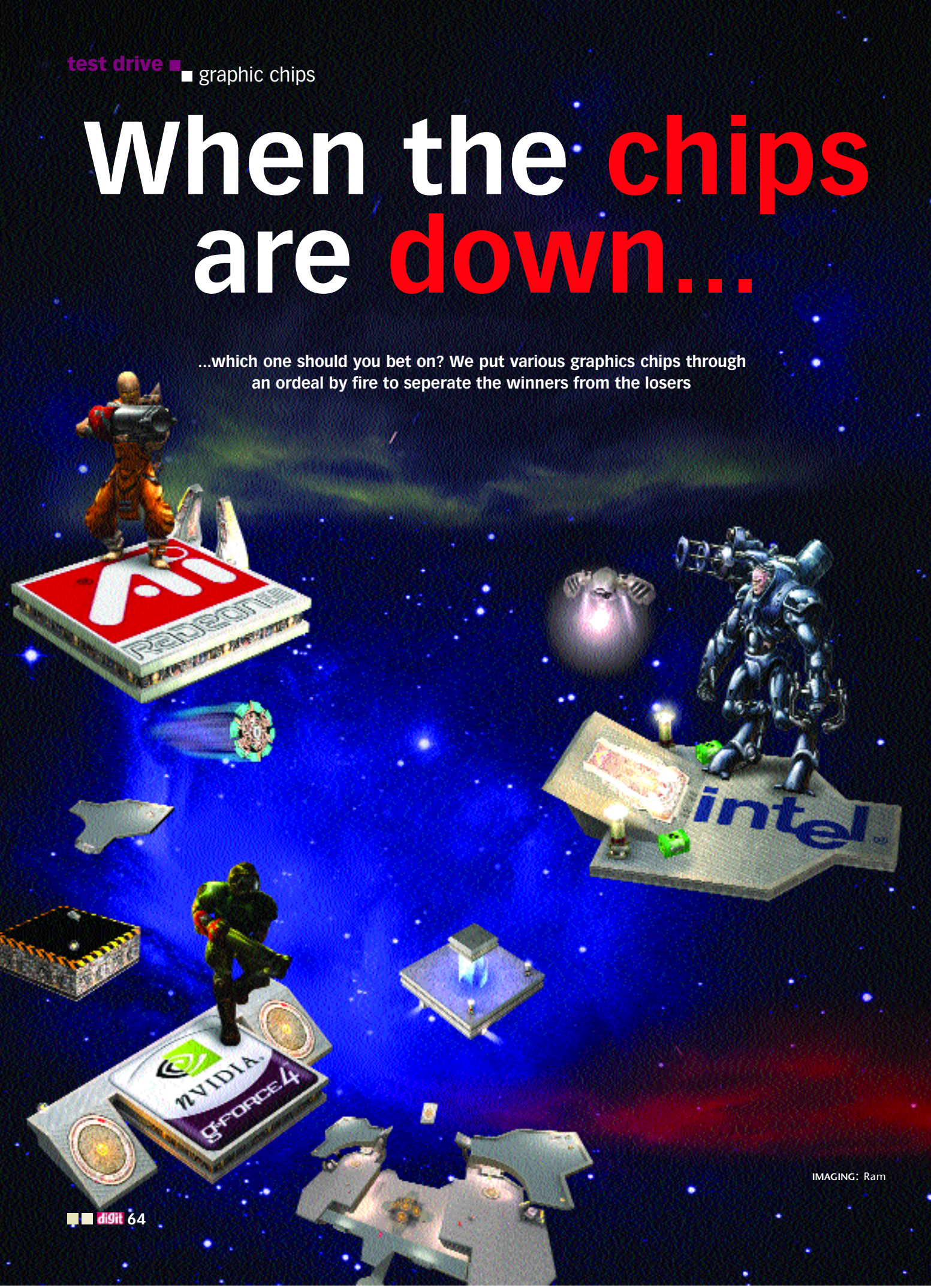
DIGIT TEST CENTRE

Shopping for a Scanner

- Always check the optical resolution of the scanner and not the interpolated resolution.
- Make sure the scanner comes complete with all connection cables and especially the drivers for your operating system.
- Always cross-check the warranty—whether it is a carry-in or onsite warranty.
- If you often need to scan transparencies, buy a scanner that allows you to connect a transparency adapter.
- Always examine the scanner glass to ensure that it is clean; a dirty scanner glass will drastically affect the scan quality.
- A flexible lid makes it easier to scan books and 3D objects.
- Opt for a scanner that supports 48-bit colour depth.
- Go in for a scanner with a good software bundle—it could save you on buying an image editing and an OCR software.

When the chips are down...

...which one should you bet on? We put various graphics chips through an ordeal by fire to seperate the winners from the losers



IMAGING: Ram

Graphics chipsets have undergone a major metamorphosis from the time they were first introduced. Manufacturers have always kept the end-users interested by releasing newer, faster and even more feature-crammed chipsets. The graphics chipset has evolved from a polygon-pumping machinery to a completely programmable solution that could very well revolutionise the way we work and play.

It all started innocently enough when 3Dfx released their Voodoo chipset and forever changed the way games were perceived. Things soon snowballed and the year 1998 saw a boom in the graphics sector with the release of a number of high performance 3D chipsets like ATi's Rage 128, nVidia's Riva TNT, Matrox's G200 and S3's Savage 3D.

The intense competition forced manufacturers to adopt a six-monthly product cycle that doubled the performance of their offerings. The heat of the game got to a few companies and they had to leave the business, huffing and panting—3dfx made a surprising exit, Matrox went the 2D way, 3Dlabs decided to cater to the niche market of CAD/CAM professionals. The gamer got the short end of the stick with only ATi and nVidia left standing in the fray.

What followed was a lot of catch-me-if-you-can between nVidia and ATi, as both tried to go one-up on the other with cyclical assaults. nVidia's GeForce and GeForce2 were countered by ATi's Radeon chipset, the GeForce3 GPU went up against the Radeon 8500, which was in turn upstaged by the GeForce4.

As things currently stand, nVidia still rules the market thanks to their aggressive release cycles and their excellent driver quality. But before you take the leap of faith and purchase the latest video card, temper that decision with what the Indian market has to offer you and get a better picture on the chipset that powers your next graphics card.

We have tested a number of graphics cards based on 15 discrete graphics chipsets currently available in India, to help you make that all-important buying decision.

Market reality in India

A 3D graphics card is still considered a luxury by most computer users in India and the market is still nascent. Product launch times are skewed to such an extent in India that by the time you get your hands on a GeForce4 card, nVidia would already be ready to launch its successor. Timing apart, the price at which the cards are initially sold is simply unjustifiable. This is the primary reason that compels users to shy away from high-end cards. When a graphics card is imported into India, many surcharges and custom duties are applied on it. Additionally, the local dealer and distributor knows the relative low volumes the product will sell and the short life span of each high-end graphics chipset, which forces him to levy more margins on the product, taking it further out of the reach of most users.

Also even though almost all the high-end chipsets are available in the Indian market, a major chunk of the users swear by their outdated SiS and nVidia TNT2 M64 based cards. The fact is that there are a number of better performing chipsets available at the same price point, but users are simply not aware of the situation. Take for example, the ATi Radeon VE and the nVidia GeForce2 MX200/MX400—the cards sporting these chipsets provide decent performance, are a great value for money and are ideally suited for the budget audience.

Digit Test Process

We tested cards based on all the available graphics chipsets in the market. Since most card manufacturers closely follow the chipset vendor's listed specifications, the real-world performance difference between a GeForce card from Vendor X and Vendor Y is negligible. What's important is having the requisite information to choose the graphics chipset that is right for you.

The test system consisted of an Intel Pentium 4 2.4 GHz processor based on the Intel D850EMV2 motherboard along with 256 MB of RDRAM and a 20 GB, 7,200-rpm hard disk. All 3D tests were conducted under Windows 98SE and we used Windows XP for testing the 2D performance of the cards. Prior to running the tests on every card, a ghost image of Windows 98SE was loaded, followed by a driver update. The desktop resolution was kept constant at 1024x768x16 at a refresh rate of 75 Hz. DirectX version 8.1 was used. VSync was turned off through the Display Properties and the 'Always on top' mode was disabled for the Windows taskbar.

Something for Everyone

Graphics cards don't come in the plain vanilla flavour anymore; there are many different versions available for each graphics chipset, each at varying price points. Thus, a GeForce2 chipset will have an MX variant for the budget crowd and an Ultra version for those that demand performance. Also, manufacturers add funny sounding names like Ultra, Pure, Deluxe, Pro, VIVO, etc to their cards to highlight additional features such as higher memory speeds, TV tuner capability, FM radio, Video Out, VR glasses, etc. As an example, take the cards based on the GeForce2 MX200 chipset. The Maxtone GeForce2 MX200 based cards come in three flavours: one features a TV-Out port (Rs 1,900), while the other doesn't (Rs 1,500); both have 32 MB of on-board RAM. The third variant comes with both TV-Out and an S-Video port and is priced at Rs 2,400. Sounds confusing? It is!

For testing the onboard video chipsets we used the following test beds:

- Intel 815 using the Intel D815EEA2 motherboard with a Pentium III Tualatin 1.13 GHz and 256 MB SDRAM
- Intel 845GL using the Intel D845GBV motherboard with a Pentium 4 2.4GHz and 256 MB DDR RAM

Test method

We evaluated the different chipsets on performance (75 per cent weightage) and value for money (25 per cent weightage). To separate their offering from the crowd, vendors routinely offer features such as video-in/video-out or support for 3D virtual glasses. Our standard parameters such as features, and warranty and support do not apply here since we're evaluating the graphics chips themselves and not cards based on these solutions.

Performance

When one thinks of a graphics chipset, the first question that comes to our mind is: How powerful is it? The power of a 3D graphics chipset is mainly reflected by the average frames per second it is able to output and the new technologies that it sports to give rich visual quality at sustained high frame rates. Therefore, our benchmarks consist of a number of speed and quality tests. The overall weightage

for this category is 75 per cent with speed tests getting 60 per cent weightage and quality tests getting 15 per cent.

3D speed tests

Our speed benchmarks were broken down into OpenGL and Direct3D as every 3D game released today supports either one of these standards. Therefore it's imperative that your graphics card performs well in these tests.

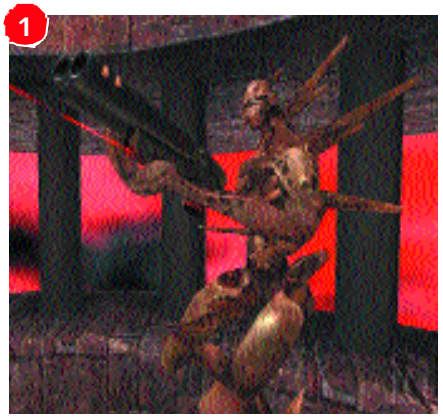
■ **Quake III Arena (OpenGL):** Extremely bandwidth-sensitive, the *Quake III Arena* engine still has what it takes to bring most graphics chips down to its knees. We used an in-game pre-recorded demo (demo four) with the retail version of *Quake III Arena* patched to version 1.30. We ran the tests in three different modes (resolution x colour depth x texture depth): Normal (640x480x16x16), High (800x600x 32x32), and Maximum (1024x768x 32x32)—and the average fps over three test runs was noted down.

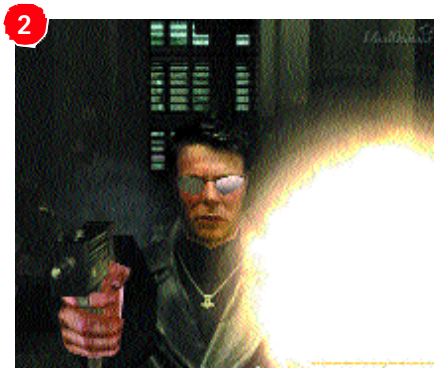
■ **3DMark2001 SE (Direct3D):** 3DMark is a synthetic benchmark that runs 21 tests to evaluate the graphics performance of your system and brings out any bottlenecks that might be hindering its performance. The test suite evaluates various features supported by the graphics chip including hardware Transform and Lighting, fill rate, image quality, etc. This new version also tests the performance of the latest programmable graphics chips. We ran 3DMark at the default settings (1024x768 at 32-bit colour with trilinear filtering and hardware T&L support enabled).

■ **Comanche 4 (Direct3D):** *Comanche 4* is a helicopter-based action game that pushes the video chipsets to their limits. Good performance under this benchmark guarantees a safe and future-proof buy. We ran the tests in three different settings: 640x480x16, 800x600x16 and 1024x768x32—and the average fps was noted down. A chipset has to support Hardware T&L for this benchmark to run.

2D speed tests

For the 2D speed test, we used PCMark2002 Pro to check the speed of a particular chipset in drawing 2D lines, curves and images. This program runs a series of benchmarks that tells you whether your graphics chip can handle the day to day work under the latest operating systems. This test was performed under Windows XP.





Our test suite consisted of two games and one benchmark application:
1. Quake III Arena, which is an OpenGL-based 3D game
2. 3DMark2001 SE, which is a benchmark that tests DirectX 8.1 compatibility of a video chipset
3. Comanche 4, which is a Direct3D-based game that utilises advanced pixel and shader effects present is newer graphics chipsets

Quality tests

The 2D image quality of the graphics chips was tested under Windows XP. We used an ordinary word document filled with text in different font types and sizes to evaluate the 2D quality of the graphics chips. The 3D image quality was tested using *Quake III Arena* with FSAA and anisotropic filtering turned on (1024x768x32, 2x/4x FSAA and anisotropic filtering). We took screenshots at selected points in the game and checked for quality issues such as aliasing problems, texture artefacting and colour bleeding.

Value for money

This provides us with a price-performance ratio. A chipset offering good performance at a great price will score higher in this category than one offering excellent performance with a hefty price-tag. We

computed this value by taking into consideration the price of the cheapest card available in the market for each graphics chipset. The weightage allotted to this category was 25 per cent .

How they fared

Sure games are cool, games are fun, but not if they run like a slideshow on your system. To truly enjoy a game, a decent frame rate is an absolute essential. Of course, the word decent is relative and can mean anything from 30 fps for a role-playing or an adventure game, to 60 fps for an action packed game like Quake III Arena.

3D performance

The main aim here was to evaluate which chipset was the ultimate performer on the basis of raw speed. In 3D graphics terminology, speed is measured in frames per second (fps) or the number of frames that a chipset can output in one second.

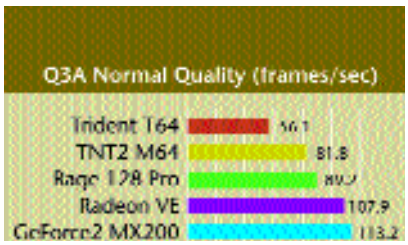
If you want an enjoyable experience, 30 fps is the minimum that you should expect from any game. However, games are fickle things—in one scene you might see trees waving in the air and nothing but some rocks to keep you company, while the next second the entire screen could be filled with monsters and general baddies of all sizes and shapes. A scenario like this is not uncommon, regardless of the type of game and it will always cause a sudden and drastic drop in the frame rate. Thus, it is not without reason that we have considered a frame rate of 60 fps as the minimum that your graphics chipset should run a game at. This will be our cut-off value, anything above is cool and anything below is not.

Quake III Arena (OpenGL)

With the Quake III Arena engine powering most of the new first person action games, you're assured of adequate performance across the board if your graphics chip can handle this test.

Normal quality: This is a very low-resolution, no-frills setting. It is not meant for the serious gamer, but rather for someone who enjoys that occasional game of *Quake* during coffee breaks. As you can expect, the mid and the high-end chipsets burn right through this test and are not worth talking about here. Only the absolute lower-end graphics chips like the Trident T64, nVidia TNT2 M64, ATi Rage 128 Pro, ATi Radeon VE and nVidia's GeForce2 MX200 are stressed under this mode.

The performance of the T64 was not up to par as promised by its specifications on paper. It managed only a lowly 56.1 fps. The nVidia TNT2 M64 scored 81.8 fps in the same test and easily overshadowed the T64. It comes across as a much safer bet if you want to have a decent gaming experience without burning a hole in your pocket. The final contender from amongst these old chipsets is the ATi Rage 128 Pro. It sports a 128-bit wide memory bus which provides it with a memory bandwidth of 2.5 Gbps, almost double that of the TNT2 M64. The core though, still runs at a lowly 140 MHz and is based on a 128-bit architecture. The performance of the Rage 128 Pro falls between that of a TNT2 M64 and GeForce2 MX200 chipset and offers a healthy 89.2 fps.



The ATi Radeon VE performs significantly better than its older cousin, breaking the 100 fps barrier with a score of 107.9 fps. If you fancy an ATi card which also offers excellent 2D and 3D quality visuals, then a card based on this chipset would be a good choice. The GeForce2 MX200 is the last budget chipset under consideration. It sports a similar architecture and is a direct contender with the Radeon VE chipset. The MX200 is also the fastest amongst the older generation chipsets (it delivers a cool 113.2 fps) which shouldn't be surprising considering the fact that it is a stripped down version of the higher-end GeForce2 chips.

High quality: This setting offers a balanced combination of a decent resolution with good picture quality and is quite harsh on the lower-end graphics chips. Since we have decided to keep the cut off at 60 fps, we'll have to wave our low-end buddies goodbye.

The mid-range of the graphics spectrum comprises of the GeForce2 MX400, ATi Radeon 7500, GeForce2 Ti VX and the GeForce4 MX420 chips. The GeForce3/4 and the Radeon 8500 are still too powerful to be perturbed at this setting.

The first of our two mini battles takes place between the GeForce2 MX400 and the Radeon 7500. The MX400 puts up a healthy score of 85.7 fps but it is not enough to distance itself from the 7500. We see that the ATi chip does pretty well for itself, registering a score of 115.3 fps. The Radeon 7500 is manufactured using a 0.15 micron process, which allows for an increased core frequency. This baby runs at a neat 270 MHz core and 460 MHz DDR memory speeds and has enough power to zoom past the MX400 without trouble. Moreover, the Radeon has some nifty memory optimisations which take it further past its competitor in this 32-bit colour test.

Our second battle takes place between two nVidia brethren: the GeForce2 Ti VX and the GeForce4 MX420 chips. The GeForce4 tag on the latter chipset is a misnomer. In reality the GeForce4 MX420 suffers from a great deal of ignominy due to the fact that it hardly carries any of the GeForce4 chipset features. Nevertheless, it does manage to show its teeth and beats all of the chipsets mentioned in this test. It scores a wonderful 152.8 fps.

We finally finish this round up with the GeForce2 Ti VX. This chipset packs a pretty mean punch and finishes a close second to the GeForce4 MX420 with 134.5 fps. Cards based on this chip can be considered pretty affordable and thus we can safely recommend this chipset to those of you who are looking for a cheaper alternative to the GeForce4 MX420 chipset.

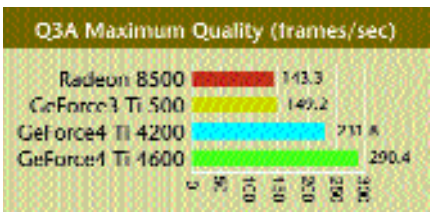
Maximum quality: To put the latest graphics chipsets through their paces and evaluate their performance, a resolution of 1024x768 is a must. The high quality of visuals that this mode delivers rules out every other chipset except for the latest generation GPUs. The maximum quality test is useful to evaluate the memory bandwidth of a chipset, since the textures are now much larger than those used in the previous modes.

This is where things get interesting, as the GeForce2 MX400 leaves us and the big guns from nVidia and ATi decide to crash the party.

An interesting observation that this test offers is that almost all the cards from the mid-range pass our 60 fps hurdle to join us in this final round. Some of these chipsets are based on old technology while others are brand-spanking new, with cool features to boot and a promise of a healthy life-cycle. This is what will separate the grain from the chaff in this test, we think. Remember, we will assume that budget is a thing of the past and you are looking for the best. If you are still restricted by the green stuff, then by all means go for one of the mid-range chipsets—they should serve you just fine.

With that out of the way, we decide to shift our attention to the ATi Radeon 8500, nVidia's GeForce3 Ti 500, GeForce4 Ti 4200 and GeForce4 Ti 4600. All the chipsets that will now be discussed are known as GPUs, short for Graphical Processing Units since they are programmable. This is where the future lies and if you are spending a significant amount of money on a card based on one of these chipsets, you need to be assured that future games will not leave it panting.

Let us start with the ATi card. The Radeon 8500 is future proof, and John Carmack, the id Software programming guru, reckons that this chipset will be more than capable of running the highly-anticipated *DOOM III*. The Radeon 8500 also offers an excellent anti-aliasing and anisotropic filtering solution—features that help enhance the 3D quality of a game. However, the fact remains that ATi has iffy drivers, as it will soon be evident. Considering the superior architecture and the price that you pay for this card, one would expect it to run alongside the GeForce4 chipsets, but we observe otherwise (it scores only 143.3 fps). Also noteworthy is that a card based on an ATi chipset will always offer excellent 2D and 3D quality. Moreover, the Radeon 8500 accelerates your DVD for crisp and clear viewing. If you find these facts alluring, then by all means go for this chipset.

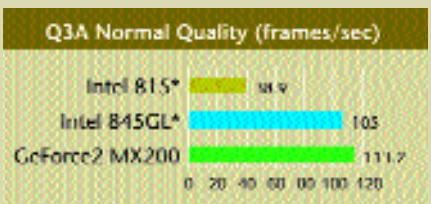


The performance of the GeForce3 Ti 500 chipset brings into question the driver quality of the ATi chips. Although inferior to the 8500, the Ti 500 is almost 6 fps ahead of the former (149.2 fps). The possibility that current games are not designed to get the most out of the brand new Radeon 8500 goes for a toss as we see the architecturally similar GeForce4 Ti 4200 and Ti 4600 do pretty well for themselves.

Too well in fact, they burn right through everything. Posting an amazing 231.8 fps the GeForce4 Ti 4200 puts everything else to shame. The chipset is quickly upstaged by its older brother the Ti 4600 that comes quite close to that magical score of 300 fps (290.4 fps).

Integrated Graphics

Graphics chipsets integrated onto motherboards have always come as an ideal solution for the budget-conscious consumer. When Intel came out with a motherboard based on the 810 chipset, they became quite popular in the value category. The main reason for this was that the boards were priced low and the graphics performance offered by them enabled the user to play most of the games available then. The only drawback was that your upgrade choices were limited by the lack of an AGP slot on these motherboards. Intel followed up the success of the 810 chipset with another successful entry—the 815 chipset. This chipset offered better performance than the 810 and boards based on these chipsets even sported an AGP slot for future upgrades. The latest offering from Intel, the 845GL chipset, aims to further increase performance levels in the onboard graphics arena.



**These are chipsets that are integrated into your computer system motherboard*

Both the current chipsets, the 815 and the 845GL, performed adequately through our speed tests—in *Quake III Arena*, you can expect decent performance with the 845GL at lower resolutions as reflected by its score of 105 fps. Also, even though its 3DMark2001 score bordered on the lower end of the spectrum, the 845GL with 1345 3DMarks can hold its own against GeForce2 MX200 based solutions. Not too bad considering that this onboard video chip misses out on the more whiz-bang features that are available in the current generation 3D chipsets.

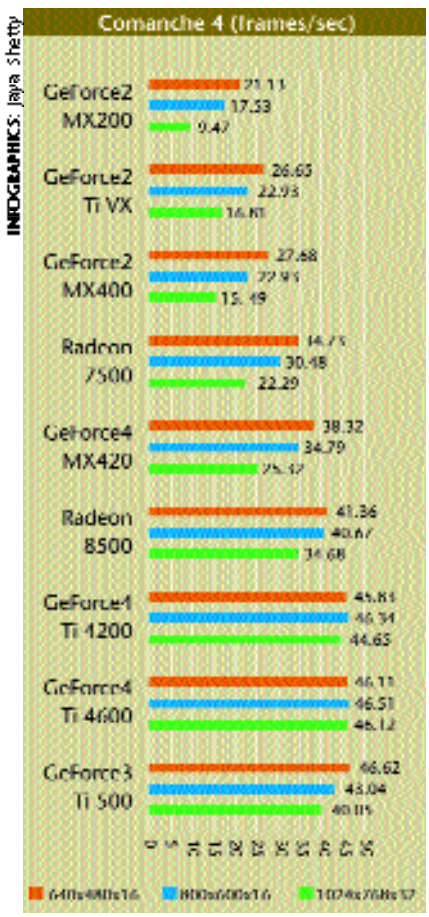
The GeForce4 Ti 4200 and Ti 4600 are nVidia's answer to the Radeon 8500. Although the 8500 retains a slight lead in the architecture department, consider the excellent driver support that nVidia provides and the fact that the Ti 4200 and Ti 4600 are designed with future games in mind and you have the winners among the big boys.

Comanche 4 (Direct 3D)

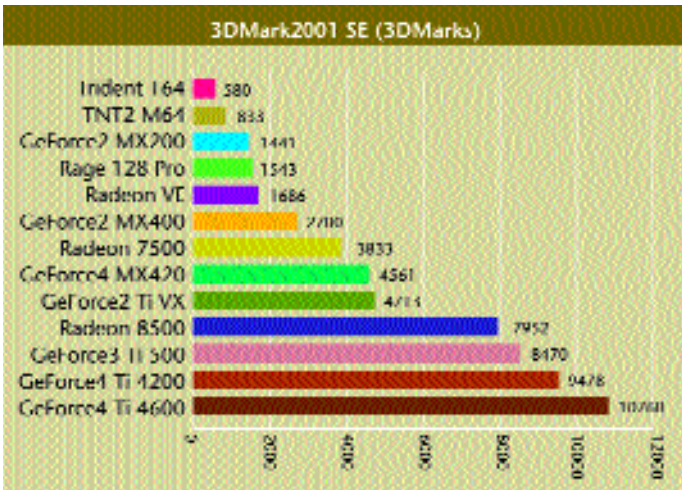
Comanche 4 is a helicopter-based action game that demands a chipset with hardware T&L support in order to run. Our low-end solutions are thus shown the door as the ATi Rage 128 Pro, Radeon VE, Trident T64 and the TNT2 M64 walk out in shame.

At the highest resolution of 1024x768, the GeForce2 MX200 scores a pitiful 9.47 fps while the MX400 manages to squeeze out a mere 15.49 fps. Even at lower resolutions neither of these chipsets managed to cross the bare minimum score of 30 fps. The ATi Radeon 7500 and the GeForce4 MX420 also show a similar performance and fail to cross the 30 fps mark. Considering the fact that these chipsets should allow for higher resolution gaming, their performance in anything except the lowest setting reflects quite badly on them.

None of the chipsets in our test manage to cross our 60 fps boundary. Even the high-end GPUs are left licking their wounds at around 40-50 fps. An interesting fact to note is the difference in the scores that the GPUs registered under the three resolutions—the point of interest being that there is virtually no difference! The ATi 8500 maintains a score in the 35-40 fps range, regardless of resolution.



Similarly, the GeForce3 and the GeForce4 chipsets hover around the 40-45 fps mark, neither rising nor falling significantly. (Another noteworthy point is that the GeForce3 Ti 500 chipset beats the GeForce4 Ti 4200 and Ti 4600 at lower resolutions.) The reason might be one of two things: the engine running *Comanche 4* is extremely CPU sensitive and will only scale with processor speed, not so much the graphics chipset speed. Or, the CPU in the test system is being a bottleneck and is not feeding



enough data to our GPUs to let them do their thing.

3DMark2001 SE (Direct 3D)

As we move on to the 3DMark2001 SE benchmark, we need to change a few rules. Since this benchmark evaluates much more than just the frame rate, our magic number of 60 fps is no longer valid. The benchmark awards a number, known as a 3DMark to each chipset, after it has performed the 21 tests. Based on the number we can safely comment on the game worthiness of the particular chipset in question.

A synthetic test like this will give you a fair representation of how any Direct3D game will perform on your system. If you want to play the next generation of Direct3D games, like *Unreal Tournament 2003*, then scores upwards of 5000 3DMarks are recommended. Few older generation chipsets can manage to cross that number. A more forgiving game like *Need for Speed 5: Porsche Edition* will require a minimum of 2000 3DMarks to run successfully.

The low-end chipsets, not surprisingly, fare pretty badly. The Trident T64 comes across as the worst of the performers with a lowly 580 3DMarks, closely followed by the TNT2 M64 with a score of 833 3DMarks. The GeForce2 MX200 manages to cross the 1000 barrier with a so-so score of 1441 3DMarks, a performance closely mirrored by the ATi Rage 128 Pro (1543 3DMarks) and the ATi Radeon VE (1686 3DMarks).

The nVidia GeForce2 MX400 posts a very reasonable 2700 3DMarks; a card based on this chipset may not shine under future games, but will be more than happy to take on any current generation game. Even other chipsets like the ATi Radeon 7500; the GeForce4 MX420 and the GeForce2 Ti VX fail to cross the magic 5000 number with scores of 3833, 4561 and 4713 3DMarks respectively. The GeForce2 Ti VX takes the performance lead against the MX420, once again bringing to light the true nature of the GeForce4 MX420 chipset.

Moving on to the GPUs, our 5000 3DMark barrier is well and truly broken. The ATi Radeon 8500 posts a healthy score of 7952 3DMarks and is a pretty good choice given its price. Although the GeForce3 Ti 500 scores more than the ATi Radeon 8500 (8470 3DMarks), when you compare it against its newer GeForce4 based cousins, the chipset doesn't look as attractive. The GeForce4 Ti 4200 scores an amazing 9478 points and the GeForce4 Ti 4600 is the only chipset in our roundup that crosses the 10,000 point hurdle to post a phenomenal 10760 3DMarks. This is the best chipset to be sitting in your graphics card, if price is not a factor.

2D performance

Do you click on the Windows Start button and then twiddle your thumbs while the menu appears? Does scrolling through text result in a horrendous lag? If you can identify with any of these situations then you have your video card to blame.

PCMark2002 Pro

It became evident that all of the chipsets in our test can provide decent 2D GUI speed. Even under extreme circumstances when there were multiple windows open, these chipsets did not stutter or slow down the GUI. Quite surprisingly, it was the ATi Rage 128 Pro with a score of 13706.2 lines per second and 1477.1 curves per second that took the lead here. The rest weren't beaten by a mile but lost nonetheless.

The chipset that could render the maximum number of images in a second was the GeForce2 Ti VX with an impressive 639.1 images per second and the GeForce4 MX 420 followed closely with 633.2 images per second.

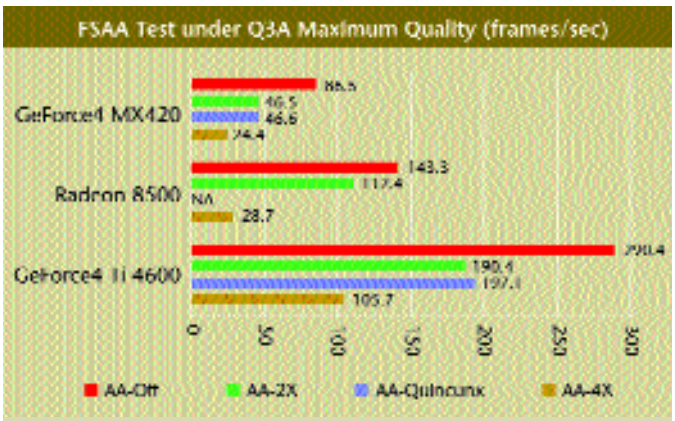
These tests confirm that all modern chipsets can handle 2D content with relative ease and if you are not the least bit inclined towards gaming, then you can pick almost any card and get more than adequate performance for your day-to-day needs.

Image quality

Image quality is a very important factor while evaluating a video chipset. A good frame rate is pretty much useless if the game looks sub-par thanks to textures that show artefacts or pixels that pop in and out of the screen. Similarly, while working with 2D, a good graphics chipset should accurately recreate colours and ensure decent rendering of an operating system's GUI.

Word Document (2D quality)

Windows XP has a nifty feature called Clear Type font, which basically anti-aliases the on-screen text to give a crisp and clear look that is much easier on the eyes. Some of the latest graphics chipsets (like the ATi Radeon 8500 and the nVidia



Given the excellent visual quality that FSAA delivers, a suitable implementation that limits the performance hit when using this feature is a major selling point of all of the new generation chipsets. As this graph demonstrates, at the medium FSAA setting of 2x, both the ATi Radeon 8500 and the Geforce4 Ti 4600 excel at delivering good frame rates. However, the Ti 4600 demonstrates its true power by offering a mind-blowing 105.7 fps at the maximum AA setting of 4x which leaves the 8500 far behind.

Geforce4 Ti 4200/4600) have a feature that accelerates this anti-aliasing in hardware.

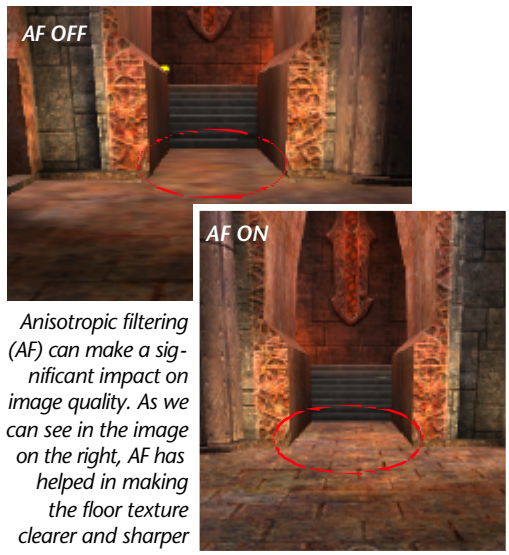
We found almost no differences between the chipsets here. All the tested chips performed well and the Word document showed no visible errors under any of these chipsets. The differences were so minute that we had to stick our noses to the monitor to notice anything worthwhile. All in all, the performance was pretty similar across the board.

Quake III Arena (3D quality)

Introduced by 3dfx in their now defunct Voodoo 5 chipset, Full Screen Anti-Aliasing (FSAA) has now become a major factor in determining 3D quality. Along with the recently introduced feature of anisotropic filtering, FSAA can provide 3D images that are crisp, clear and free of artefacts. Of course, not all the chipsets tested sported these features and thus the quality of their output was not up to par.

The TNT2 M64 and the Trident T64 fared the worst in this test. The image quality within *Quake III Arena* looked washed out when running under these chipsets.

One fact was clearly evident after scouring all the images. The entire Radeon chipset series (the VE, 7500 and the 8500) have brilliant 3D image quality. Of the GeForce series, only the GeForce4 managed to score



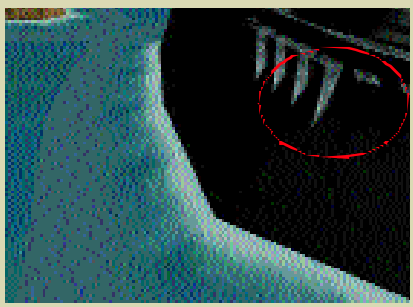
Anisotropic filtering (AF) can make a significant impact on image quality. As we can see in the image on the right, AF has helped in making the floor texture clearer and sharper

Advanced Imaging Features

Be it nVidia with its nFiniteFX engine or ATi with its Truform technology, great efforts are taken by the chipset makers to incorporate features that can enhance image quality without sacrificing on performance.

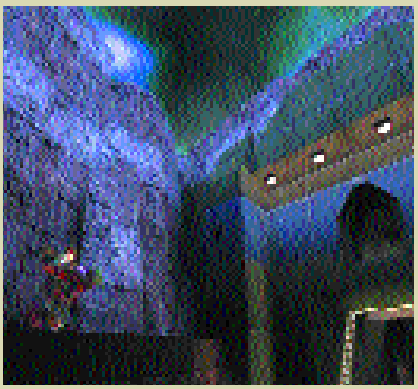
New features like Environment Mapped Bump Mapping (EMBM), Full Screen Anti-Alaising (FSAA), Programmable Vertex and Pixel Shaders, 3D Textures, Shadow Buffers, are promising to deliver the holy grail of computer graphics—true-to-life realism.

Anti-Aliasing (AA): This is an important feature which is incorporated in the new generation chipsets and which greatly enhances image quality. Simply put, AA reduces the jagged edges that are visible on the textures comprising a 3D game. Enabling AA reduces frame rates considerably, but the trade-off is excellent picture quality.



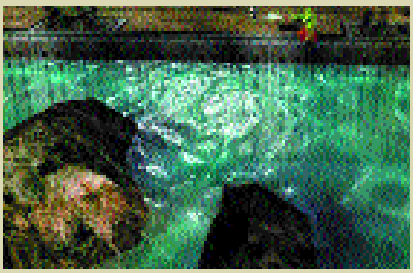
Anti-aliasing removes the jagged step-like artefacts along the edges of game objects

Anisotropic filtering: This serves to reduce texture artefacting and blurring and greatly enhances the image quality with the help of advanced texture filtering techniques. This feature is seen in the latest chipsets such as the GeForce3/4 and the Radeon 8500. Anisotropic filtering in tandem with AA provides excellent, crisp, artefact-free visuals, albeit at a frame rate loss.



Anisotropic filtering greatly enhances the fidelity of an in-game texture. As seen here, the walls sport sharp colours and clean shadows, thanks to this feature

Bump mapping: This is a visual trick that attempts to simulate a texture's roughness or smoothness, depending on how the texture reflects lights. Therefore, you can now have a pond of water with life-like ripple and wave effects. The common techniques used for bump mapping are Emboss Bump Mapping, DOT3 Bump Mapping, Environment Mapped Bump Mapping and True, Reflective Bump Mapping.



Bump mapping has been used in this game to give wave and ripple effects to the water

Programmable shaders: The biggest breakthrough in graphics technology would have to be the introduction of programmable shaders in graphics chipsets, which give developers complete freedom to create custom special effects for their games. Therefore, next generation games will feature eye-candy such as underwater refractions, facial expressions, realistic skin and hair that will make game characters and environments look more true to life than ever before!

Pixel and vertex shaders will enable game developers to create highly-detailed characters like Wolfman here

SCORE BOARD

Graphics Chipsets at a Glance

MODEL	TNT2 M64	Trident T64	ATI Rage 128 Pro	ATI Radeon VE	ATI Radeon 7500	ATI Radeon 8500
FEATURES						
Manufacturing Process (microns)	0.25	0.25	0.25	0.18	0.18	0.15
Core Architecture (bits)	128	128	128	128	128	128
Clock Speed (MHz)	125	125	140	183	270	275
Memory Speed (MHz), Type	150, SDR	150, SDR	160, SDR	370, DDR	460, DDR	550, DDR
Memory bus width (bits)	64	64	128	64	128	128
Memory bandwidth (Gbps)	1.2	1.2	2.5	2.9	7.3	8.8
RAMDAC Speed (MHz)	300	300	300	350	350	350
Max Resolution Supported (Hz)	1920x1200 @75	1600x1200 @75	1920x1200 @75	2048x1536 @75	2048x1536 @75	2048x1536 @75
Interface (Type/Version)	AGP/4X	AGP/4X	AGP/4X	AGP/4X	AGP/4X	AGP/4X
Fill rate (Millions of Texels/sec)	250	250	NA	NA	1700	2000
Millions of Triangles/sec	9	8	8	NA	45	60
Hardware T&L Support	✗	✗	✗	✗	✔	✔
Rendering Architecture						
Pixel Pipelines	2	2	2	2	2	4
Texture Mapping Units (per pipeline)	2	2	2	2	3	3
Pixel Shader/Vertex Shader	✗ ✗	✗ ✗	✗ ✗	✗ ✗	✗ ✗	✔ ✔
Visual Effects						
Bump Mapping Technology	NA	NA	Emboss, DOT3	Emboss, DOT3, EMBM	Emboss, DOT3, EMBM	Emboss, DOT3, EMBM
Hardware Anti-Aliasing Technology	NA	NA	4X	4X	4X	4X
Trilinear/Anisotropic Filtering	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔
PERFORMANCE						
3D Speed Tests						
Quake III Arena (fps)						
Normal (640x480x16)	81.8	56.1	89.2	107.9	241.6	358.6
High (800x600x32)	26.8	19.2	41.3	47.4	115.3	247.6
Max (1024x768x32)	14.8	8.5	22.2	25.4	60.5	143.3
3DMark2001 SE (3DMarks)	833	580	1543	1686	3833	7952
Comanche 4 (fps) **						
640x480x16	0	0	0	0	34.73	41.36
800x600x16	0	0	0	0	30.48	40.67
1024x768x32	0	0	0	0	22.29	34.68
2D Speed Tests						
PCMark2002 Pro						
2D Lines (Lines/sec)	13458.6	12985.8	13706.2	13691	13157.5	12840.4
2D Curves (Curves/sec)	1446.4	1464.4	1477.1	1475.9	1461.3	1459.5
2D Image Drawing (Images/sec)	542.1	454.9	523.5	495.5	480.7	482.8
Image Quality Tests						
Word Document (Scale of 5)	2.5	2.5	2.5	2.5	3	3.5
Quake III Arena (Scale of 5)	1.5	2.5	3	4	4	4
OVERALL SCORE						
Performance (75%)	18.1	18.5	22.1	22.7	41.7	54.6
Value for Money (25%)	13.12	22.47	3.86	10.23	8.63	5.78
Overall Product Rating	31.23	41.01	25.98	32.93	50.35	60.42
Overall Grade	C	C+	C-	C	B	B+
Price Range (In Rupees)	2,300	1,375	9,550	3,700-5,550	8,050	15,750
Cards using this chipset and contact details	**MSI-MS8088** (Priya Ltd, jain@priyagroup.com)	**Maxtone Trident Blade T64** (Maxtone Electronics Pvt Ltd, maxtone@vsnl.com)	**Supergrace ATI All In Wonder Pro** (Integra Micro Systems Pvt Ltd, mumbai@integramicro.com)	**Ennyah ATI Radeon VE** (Great World Tech Pvt Ltd, sales@gtechworld.com), **Supergrace ATI Radeon VE** (Integra Micro Systems Pvt Ltd, mumbai@integramicro.com)	**Supergrace ATI Radeon 7500** (Integra Micro Systems Pvt Ltd, mumbai@integramicro.com)	**Supergrace ATI Radeon 8500** (Integra Micro Systems Pvt Ltd, mumbai@integramicro.com)

** Integrated video on motherboard*

***Comanche 4 needs Hardware T&L support*

GeForce2 MX200	GeForce2 MX400	GeForce2 Ti VX	GeForce3 Ti 500	GeForce4 MX420	GeForce4 Ti 4200	GeForce4 Ti 4600	Intel 815*	Intel 845GL*
0.18	0.18	0.18	0.15	0.15	0.15	0.15	NA	NA
256	256	256	256	256	256	256	128	128
175	175	250	240	250	250	300	NA	200
166, SDR	166, SDR	400, DDR	500, DDR	333, DDR	444, DDR	650, DDR	NA	NA
64	128	128	128	128	128	128	128	128
1.3	2.7	6.4	8	2.6	8	10.4	NA	NA
350	350	350	350	350	350	350	230	350
2048x1536 @75	2048x1536 @75	2048x1536 @75	2048x1536 @75	2048x1536 @75	2048x1536 @75	2048x1536 @75	1600x1200x@60	2048x1536 @6
AGP/4X	AGP/4X	AGP/4X	AGP/4X	AGP/4X	AGP/4X	AGP/4X	AGP/4X	AGP/4X
700	700	1000	3800	1000	4000	4800	NA	NA
20	20	31	48	31	130	136	NA	NA
✔	✔	✔	✔	✔	✔	✔	✘	✘
2	2	4	4	2	4	4	NA	NA
2	2	2	2	2	2	2	NA	NA
✘ ✘	✘ ✘	✘ ✘	✔ ✔	✘ ✔	✔ ✔	✔ ✔	✘ ✘	✘ ✘
Emboss, DOT3	Emboss, DOT3	Emboss, DOT3	DOT3, EMBM	Emboss, DOT3, EMBM	Emboss, DOT3, EMBM	Emboss, DOT3 EMBM	Emboss, DOT3	Emboss, DOT3
4X	4X	4X	4X	4X, Quincunx, 4XS	4X, Quincunx, 4XS	4X, Quincunx, 4XS	4X	4X
✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔
113.2	231.8	366.7	278.4	321.6	372.1	379.5	38.9	105
46.7	85.7	134.5	242.2	152.8	339.2	367.3	20.8	37.4
23.9	41.3	68.9	149.2	86.5	231.8	290.4	11.4	0
1441	2700	4713	8470	4561	9478	10760	601	1345
21.13	27.68	26.65	46.62	38.32	45.83	46.11	0	0
17.53	22.93	22.93	43.04	34.79	46.34	46.51	0	0
9.47	15.49	16.81	40.05	25.32	44.65	46.12	0	0
13454	13454.8	13418.5	13259.3	13443.9	13417.6	13409.2	12485.3	13453
1467.2	1464.3	1465.9	1467.8	1469.3	1466.9	1465.1	1460.2	1462.6
527.5	534.1	639.1	628.8	633.2	628.4	629.5	453.8	540.9
3	3	3	3.5	3.5	3.5	3.5	3	3
3	3	3	3	3	4	4	2.5	3
29.1	35.9	42.3	53.0	46.0	62.3	64.9	18.6	21.8
23.07	18.12	9.92	4.28	8.72	5.53	3.13	25.00	25.00
52.17	54.00	52.21	57.32	54.76	67.85	67.99	43.57	46.79
B	B	B	B+	B	A-	A-	B-	B-
2,100-7,000	3,300-4,300	7,100	20,650	8,000-13,000	18,750	34,500-40,000	NA	NA
Maxforce GeForce2 MX200 (Maxtone Electronics Pvt Ltd, maxtone@vsnl.com), **ASUS GeForce2 MX200 Magic** (Rashi Peripherals, ho@rptechindia.com), **MSI GeForce2 MX200** (Priya Ltd, jain@priyagroup.com)	**Maxforce GeForce2 MX400** (Maxtone Electronics Pvt Ltd, maxtone@vsnl.com), **MSI GeForce2 MX400** (Priya Ltd, jain@priyagroup.com)	**ASUS V7700 Ti VX** (Zeta electronics, tejas@zetaindia.com)	**ASUS V8200 Ti 500 Deluxe** (Rashi Peripherals, ho@rptechindia.com)	**ASUS V8170 Magic** (Zeta electronics, tejas@zetaindia.com), **ASUS V8170 SE** (Zeta electronics, tejas@zetaindia.com)	**ASUS V8420 Deluxe** (Zeta electronics, tejas@zetaindia.com)	**ASUS V8460 Ultra** (Zeta electronics, tejas@zetaindia.com), **ASUS V8460 Ultra Deluxe** (Zeta electronics, tejas@zetaindia.com)	**Intel Desktop Motherboard EEA2** (Nebula Technologies, pradip@nebulatech.com)	**Intel Desktop Motherboard D845 GBV** (Nebula Technologies, pradip@nebulatech.com)

Decision Maker			
You want	A graphics chipset that helps you play an occasional game. Needs to be cheap	A solution that should run most of the games, but price is a consideration	Top-notch performance in both 2D and 3D. Price no bar!
You need	A chipset that will give you a minimum of 60 fps in low resolutions with compromises in visual quality	A chipset that will give you a minimum of 60 fps in medium resolutions with minimum compromises in video quality	You need maximum performance with all the eye candy enabled and with zero compromise in resolution or quality
Look for	Cards based on the nVidia GeForce2 MX200 and the GeForce2 MX400 chipsets	Cards based on the nVidia GeForce2 Ti VX and the GeForce4 MX420 chipsets	Cards based on the ATi Radeon 8500, the nVidia GeForce4 Ti 4200 and the Ti 4600 chipsets
Recommended System	Intel Pentium III 500 MHz, 64 or 128 MB RAM	Intel Pentium III or AMD Athlon 1 GHz, 128 or 256 MB RAM	Intel P4 2.4 GHz or AMD Athlon XP 1700+, 256 or 512 MB RAM
Price range	Rs 2,100 to 7,000	Rs 7,100 to 13,000	Rs 15,750 to 40,000

4 out 5 in this test. The rest languished at 3, whereas the entire ATi Radeon series scored 4 of 5.

What it all leads to...

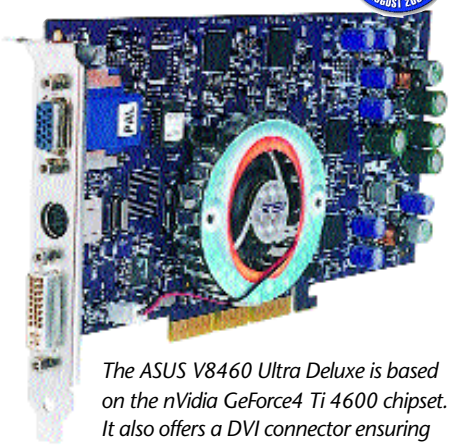
In our test process, we have tried to evaluate every nuance of what makes a good graphics chipset. Decent performance under *Quake III Arena* ensures that your graphics chip will run most current games without a hitch, while Comanche 4 and 3DMark2001 give a good indication of their performance in future games.

Overall, the results were not very surprising. Older generation chipsets did pretty badly in the high performance tests and are not for someone who is looking for a future-proof buy. The **GeForce2 MX200** comes out on top as our Best Value winner, offering adequate gaming horsepower at a price that is within most people's grasp.

However, if you want the ultimate gaming experience, don't mind the price and wish to be future-proof for a healthy period of time, you should set your eyes on the cards based on the high-end chipsets like the GeForce 4 Ti series and the ATi Radeon 8500. These chipsets feature cutting edge technology that future games will make use of. Playing games at maximum resolutions on the cards based on these chipsets is not a problem at all even if extras like FSAA and anisotropic filtering are enabled. But the truly outstanding performer in our tests was the **GeForce4 Ti 4600**. This beast is truly the fastest graphics chip in the world and wins our Best Performance Award with ease.

Winners!

nVidia GeForce 4 Ti 4600: Fresh out of the nVidia stables, the GeForce4 Ti 4600 is a real power-horse. This chipset is a piece of engineering marvel with very efficient memory architecture, and a core that is DirectX 8 compliant. It can handle current and next generation games at extremely high-resolutions with FSAA and anisotropic filtering turned on, resulting in excellent 3D quality. The fact that the chipset can support a maximum of 128 MB of high-speed, on-board DDR memory means that games featuring high-quality textures will run with ease on this chip.



The ASUS V8460 Ultra Deluxe is based on the nVidia GeForce4 Ti 4600 chipset. It also offers a DVI connector ensuring brilliant image quality on TFTs

This chipset was the clear winner in every test that we ran. It posted an amazing 290.4 fps in *Quake III Arena* at a maximum resolution and quality setting of 1024x768, running at 32-bit colour and with 32-bit textures. It also posted a record-setting score of 10760 3DMarks in 3DMark2001 SE, a benchmark that few chips can conquer. With a card based on this chipset inside your system, you won't have to worry about dropping frame rates when playing current or future games.

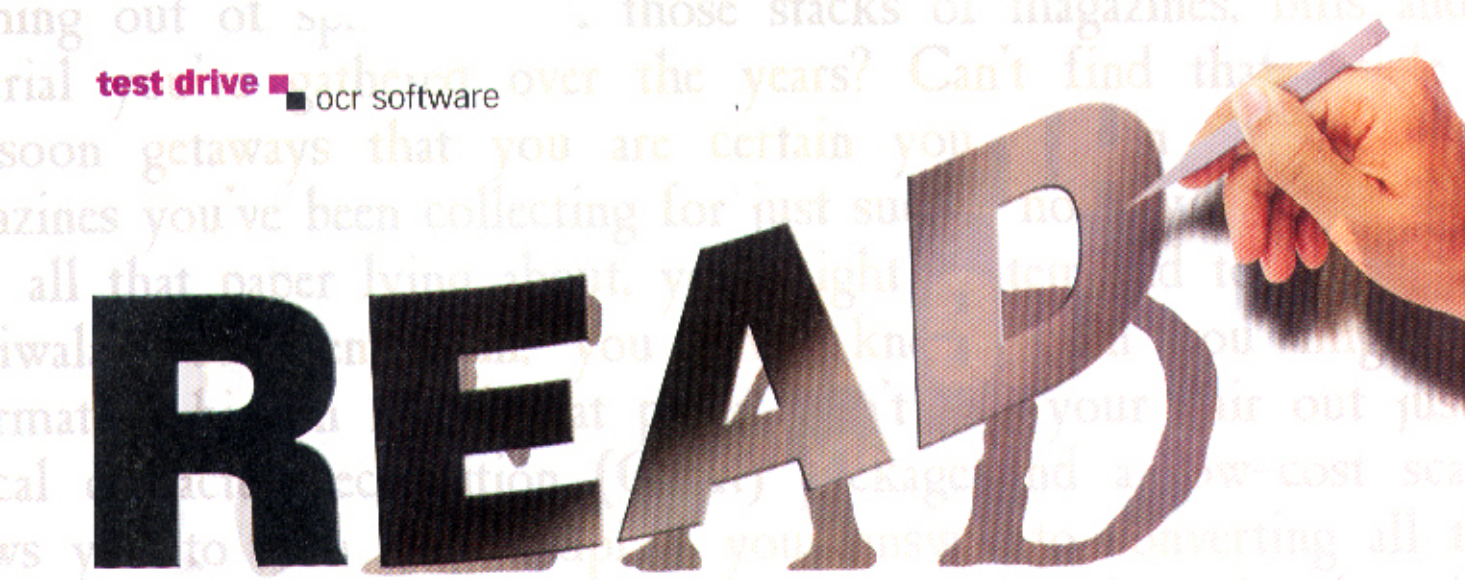
nVidia GeForce2 MX200: Based on the venerable GeForce2 chipset, the GeForce2 MX200 is an ideal purchase for those seeking a low-cost solution to their gaming needs. Sporting a twin pixel pipeline, with two texture mapping units per pipe, this chip is architecturally adept at handling all of the current-generation games.

Considering its price, the chipset did very well in our test suite. It scored an impressive 113.2 fps in *Quake III Arena* at normal quality and managed a decent showing at the high quality setting (with 46.7 fps). 3DMark2001 SE was not very kind to the older generation chipsets but the GeForce2 MX200 received a fairly decent score of 1441 3DMarks. Similarly the *Comanche 4* benchmark managed to humiliate every other low-end solution except for the MX200.

The ASUS GeForce2 MX200 Magic comes with an S-Video Out and is based on the nVidia GeForce2 MX200 chipset

It becomes pretty evident that a card based on this particular chipset would cater very well to the casual gamer. It can run almost all the games that are currently out there at a decent frame rate and if you are into slow-paced games like role-playing or adventures, this chipset will even handle them at a high-resolution.

YATISH SUVARNA and AHMED SHAIKH



READ between the lines

...ds! It is a furiously fast, unbelievably accurate and easy to ...ct designed for Windows 95/98 and Windows NT 4.0! ...es such as OLE automation, Drag&Drop, direct Word export and many more.WinOCR ... ...d highly accurate Optical Character Recognition (OCR) system that works with an ... ...pliant scanner.

Features :

Fast and accurate omni-font OCR technology re... ...fonts. Over 99% accuracy. Multi-lingual (English, German, French, Span... ..., Danish, Finnish, Irish). Powerful but extremely easy to use. Reads lette... ...sprint and faxes. Automatic de-skew to correct slanted images (up to 15 degrees). Word verifier for easy on-screen proofing. Interactive spelling checker. User definable dictionarie

IMAGING: Solomon Lewis

We test the best OCR software that promise to convert all the information stored on paper into an editable, searchable digital database

Running out of space for all those stacks of magazines, bills and research material you've gathered over the years? Can't find that article on great monsoon getaways that you are certain you saw in one of those travel magazines you've been collecting? In a fit of irritation with all that paper lying about, you might be tempted to sell it off to the *raddiwala*, but you never know when you might need the information hidden in there.

Don't tear your hair out just yet. An optical character recognition (OCR) package and a low-cost scanner that allows you to scan at 300 dpi is your answer to converting all that information on paper into a digital format, which can be archived and retrieved easily. OCR packages today include features such as batch scanning and scheduling. A text search and indexing tool completes the picture!

We test the best of the lot with a clear goal—minimal effort and maximum productivity!

Test process

The test bed used to evaluate the OCR software consisted of a Pentium III 700 MHz processor, 128 MB RAM and an 8.5 GB 5,400 rpm hard drive. We used a scanner with 24-bit colour depth and a resolution of 600x1200 dpi—you would need just 300 dpi and 24-bit colour for any OCR software to recognise fonts accurately. The test documents were scanned with default settings and saved to Microsoft Word 2000 and Excel.

Before testing each OCR package, we loaded Windows 98SE on a cleanly formatted system. Cacheman 5.11 logged the memory usage of the OCR software.

We tested the OCR software on the following parameters:

Performance: We looked for the accuracy with which the OCR engine could recognise words, characters and symbols and its ability to retain the original layout and formatting.

Another measure of good performance is the OCR software's ability to deal with many kinds of documents, some involving complex formatting and others that are smudged or have faded text. Hence, we challenged the OCR packages with a set of nine documents: a regular word document printed on an inkjet printer, a combination document with various ASCII characters and symbols, an Excel sheet with complex table formatting, a dot matrix print, photocopy of a word document, a type-written sheet, a fax copy, a newspaper sheet, and a magazine page with complex formatting.

Features: The feature set of an OCR software adds to its functionality. The features that matter include multiple language support, table recognition, scheduling and batch processing, support

for removing smudges and speckles, the ability to correct skewed scans, and the ability to process documents in landscape and portrait format depending on the text formatting, irrespective of how the document is placed in the scanner.

Ease of Use: Here we observed whether the icons had descriptive imagery or captions explaining their function, menu navigation (grouping of features, menu structure and intuitive placement of important features), presence of wizards to guide you through the OCR functions, and help and documentation.

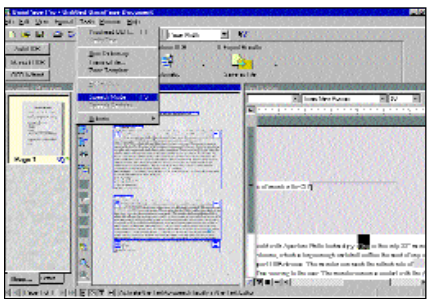
Value for money: This is a factor of the performance and features offered by the OCR package as compared to its price. The greater the performance and features and the lower the price, the higher will be the value for money offered. We computed this value by dividing the sum of an OCR software's performance and features scores by its price.

How they fared

Features

OCR-ing large volumes of prints can become a nightmare, but most good packages offer time and effort saving features.

ABBYY FineReader 6.0 CE supports an impressive 122 languages. Sadly though, Indian languages are not included! It also has a table recognition feature and retains the table layout when it saves the document as a Word file—a useful feature if you are OCR-ing balance sheets, *challans*, reports, etc. It also has support for scheduling and batch processing.



OmniPage Pro is the only OCR software with Text-to-Speech facility

The only other software to have scheduling was OmniPage Pro 11. This software supports 114 languages and can also detect page orientation. However, it does not support auto table detection, which means that you will have to manually format tables in Word documents.

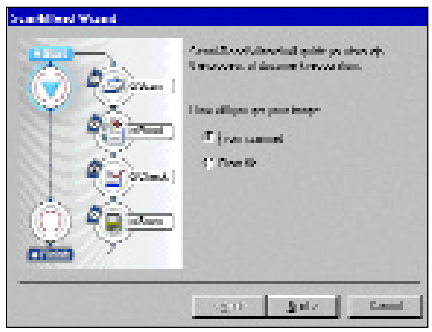
PageGenie Pro is rather meagre on features. It supports only 10 languages, and was also the only software to not have support for recognising characters placed on a coloured background—a big disadvantage if you OCR magazines, brochures or other heavily designed documents.

CuneiForm 2000 did not have support for page orientation detection. This feature makes working with magazine pages rather difficult as it affects the OCR engine's ability to pick up the formatting.

Ease of use

The simplicity of the user interface, presence of productivity enhancing tools such as wizards and auto processing, and sufficiently detailed help and documentation help ease the tedium of OCR-ing large volumes of printed documents.

ABBYY FineReader 6.0 CE and Readiris Pro 7 have the best menu navigation and structure. Both have well defined submenus and present a very intuitive interface. A wizard pops up on loading the software. Though FineReader 6.0 CE has a more sophisticated look and feel to its wizard, the functionality is similar to the other software in this comparison. The help and documentation provided with



Wizards in FineReader make OCR-ing a breeze

both software is also pretty good.

CuneiForm 2000, on the other hand, at first glance presents you with only three tabs: File, View and Help. The rest of the menu items are visible only after the page is scanned—this is quite irritating after a few attempts. It also didn't have any online help.

PageGenie Pro 4.0 was the only software here to have poor wizard functionality. It also lagged behind the others in the bundled help and documentation.

Performance

Converting those different kinds of documents, bills, receipts, and newspaper/magazine cuttings into an editable and searchable digital format can be rather frustrating if in the end the OCR software picks up junk and garbled text.

Inkjet printout: We scanned a plain text document with basic formatting such as a drop caps, bold, italics, underline, indents, Web links, superscript and subscript styles. The text used three fonts—Times New Roman, Arial and Garamond. The font size used for the e-mail and Web links was 8 and 10 points respectively, to make character recognition difficult for the OCR engines.

An inkjet printout at high quality is not too much trouble for an OCR software, as it is usually very clean, with few smudges. You should expect nothing less than 99 per cent accuracy from your OCR package and a score of 4 out of 5 for formatting. Also, there should be little or no junk characters in the OCRed documents.

All software except PageGenie logged high scores for accuracy (ranging between 97 and 99 per cent). OmniPage Pro 11 was particularly impressive, logging 99.29 per cent accuracy—the scanned document had only a couple of spelling mistakes. Plus it was the only software to retain e-mail and Web links, which were underlined and used coloured fonts, and were also clickable when saved as a Word document.

Close on its heels was ABBYY FineReader 6.0 CE, with an accuracy score of 99.05 per cent. This software, along with Readiris Pro 7, were the only two that were able to show drop caps precisely while retaining the original document layout (both scored a brilliant 4.26 out of 5).

The lowest score was of PageGenie Pro 4.0 at 92.92 per cent accuracy, which means that you will have to spend a fair amount of time correcting the scanned document. It picked up the drop caps, but displayed it as a bold font separately and wasn't able to retain the layout. PageGenie Pro 4.0 was unable to

Hands free Scanning

Tired of manually feeding in paper and scanning? An Automatic Document Feeder would be the right choice if you need to do batch processing. All you have to do is feed the necessary text documents in the tray and the Automatic Document Feeder will handle the rest.

detect the links; in fact, it failed to pick up the small-sized fonts.

Combi document: This was a test of the OCR package's ability to read special symbols (such as currency symbols, Greek alphabets and mathematical notations) commonly found in business and scientific documents. The formatting on this document included bold and italicised text and two different sets of reverse fonts—black text on grey background and white text on grey background.

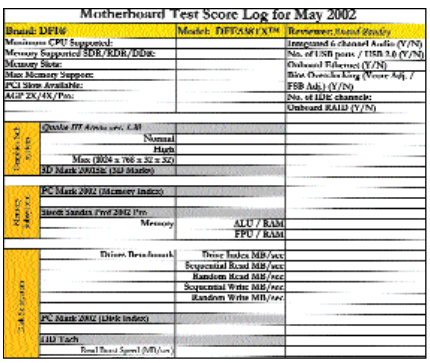
Overall, the results here were quite disappointing for accuracy as well as retaining formatting. All five software found it particularly difficult to detect the black text on grey background.

The best performer here was ABBYY FineReader 6.0 CE, with an accuracy of 96.77 per cent. It was also the best when it came to retaining formatting—it scored 2.5 out 5. However, like the other software, it was unable to detect Greek symbols such as 'µ' and 'Ø' and the currency symbols. Of the nine currency symbols included in the document, the software were only able to read $, £ and ¥— PageGenie Pro 4.0 simply ignored the entire line containing currency symbols and returned junk characters for the white text on grey background.

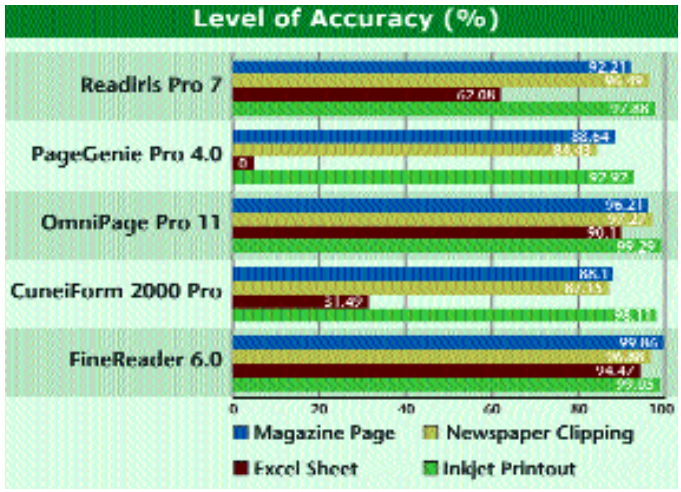
CuneiForm 2000 logged only 69 per cent accuracy—the poorest results here. The document was full of junk characters and reverse fonts were missing entirely.

Excel spreadsheet: If you have a large number of bills, *chalans* or complex Excel spreadsheets then the results of this test should be of interest to you. Here the ability of the OCR software to read characters accurately as well as retain formatting are equally important.

Our document had a table with native Excel formatting such as horizontally and vertically merged cells, text written in vertical format, and coloured cells with text and data. We also checked to see if the vertical text and ® symbol were detected after saving the file in Excel.



The Excel spreadsheet



ABBYY Finereader 6.0 CE and OmniPage Pro 11 both scored over 90 per cent in accuracy and also retained the layout. PageGenie Pro 4.0, on the other hand, did very poorly here—the entire document was filled with junk characters and was saved in one column only (it scored zero for both, layout and accuracy). CuneiForm 2000 and Readiris Pro 7 also scored nothing for layout and formatting here! Also, none of the OCR software in this test were able to retain the colour of the cells.

Dot matrix printout: Dot matrix printouts really put the OCR engine to test—here the characters are formed using fine dots and it is a great challenge for the OCR engine to recognise it as a complete letter.

ABBYY FineReader 6.0 CE again displayed its prowess in recognising characters and returned an impressive 95.28 per cent accuracy. It did miss out some characters, reading '0' as 'Q' and 'Z' as '2'. OmniPage Pro 11 came in second with a decent 91.03 per cent accuracy. Once again, only ABBYY FineReader 6.0 CE and OmniPage Pro 11 retained the layout to a certain degree and scored 2.49 out of 5 each.

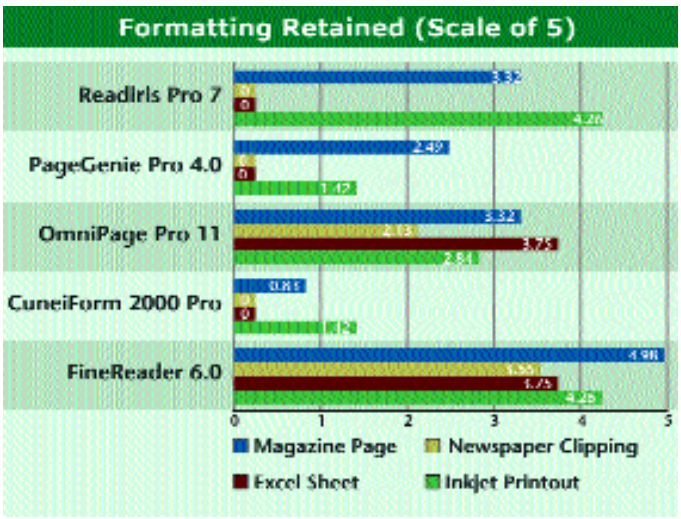
The poorest performer here was CuneiForm 2000; it scored a paltry 23.82 per cent in the accuracy test and had lots of misspelled words and junk characters. It was also the worst of the lot at retaining formatting—not a single formatting element was retained and the entire document was a mess.

Photocopied document: A photocopied document tests the true mettle of the OCR engine—the text is usually faded and there are smudges on the sheet. For this test, an inkjet printout was photocopied at normal quality mode.

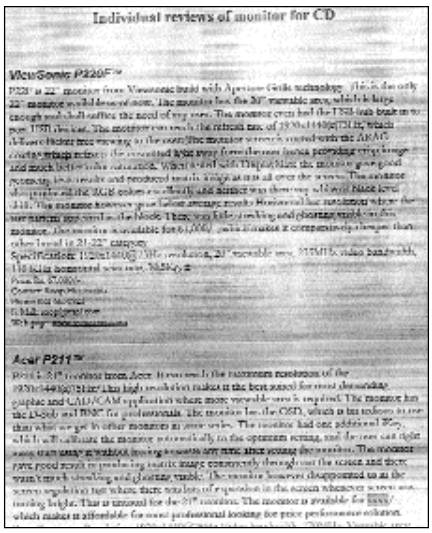
ABBYY FineReader 6.0 CE once again came out tops, with an accuracy level of 95.75 per cent—there were no junk characters in the OCR-ed document! But it scored only 3.32 out of 5 for formatting.

Tips for Better OCR Results

- A document which is free of wrinkles, tears, smudges or creases will yield more accurate results.
- Keep a sheet of white paper behind the document when you scan it for OCR-ing, especially when scanning newspapers and thin paper. This will help eliminate smudges during scanning.
- Use the Rotate and Crop tools of an imaging software to align the text if there is no Deskew option in your OCR software.
- Despeckle the scanned image before you begin OCR-ing the document. This will remove the dots (background noise) and help the OCR engine recognise neighbouring fonts correctly.
- Scan the image in full colour mode. If the document has simple black fonts on a white background, use the greyscale mode. You will get poor results if you select Line art (black and white) mode.
- Use the image splitting tool to manually define the text and image area. This will help the OCR engine retain the format and layout more accurately.
- If your documents have custom fonts and formats that are not picked up by the OCR software, train the OCR software by adding those specific fonts and letter types into its dictionary.



PageGenie Pro 4.0, on the other hand, fared poorly, logging a low 39.15 per cent accuracy. Compare this with its 92.92 per cent accuracy level in the inkjet printout test and it becomes clear that just changing the printing medium causes more than a 50 per cent drop in its character recognition capability.



Phototcopied document

OmniPage Pro 11 did really well in retaining the layout and formatting, scoring an impressive 4.15 out of 5. Readiris Pro 7 and CuneiForm 2000 on the other hand did not retain any of the layout and formatting and scored nothing!

Fax document: Yet another stress test for the OCR engine is when it comes to reading fax copies. We made a fax copy of the inkjet printout; it had a lot of smudges and smears.

Here again, ABBYY FineReader 6.0 CE was the clear winner with an excellent score of 97.16 per cent accuracy. Although there were some minor errors in recognising characters such as '1' and '0', which were read as '!' and 'Q' respectively, a score of over 90 per cent accuracy for a fax document is simply amazing. OmniPage too did well here, logging 95.75 per cent accuracy. As for retaining formatting, OmniPage Pro 11 edged out FineReader 6.0 CE by a fair margin—it scored 2.49 against 1.66 for FineReader 6.0 CE.

Readiris Pro 7 returned disappointing results with an accuracy level of only 72.87 per cent. It, along with CuneiForm 2000, scored nil for formatting because there was absolutely no font formatting left. Every font had the same font type and size and it failed to retain even simple formatting like underlines, bold text and italics text!

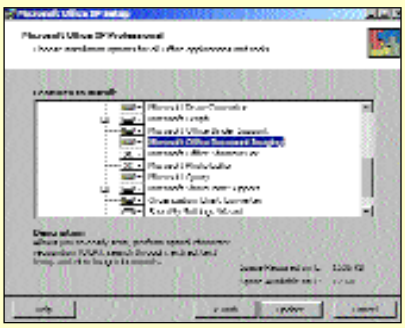
Newspaper clipping: OCR-ing a newspaper is one of the most troublesome tasks. The varied formatting, fonts, thin paper and poor print quality make it very difficult for an OCR software to recognise the text.

The newspaper clipping we used for the test had text in the standard two-column layout. Plus there were logos, reverse fonts (white on black) and highlights. There was a lot of smudging between fonts, with fonts getting mixed

Newspaper clipping

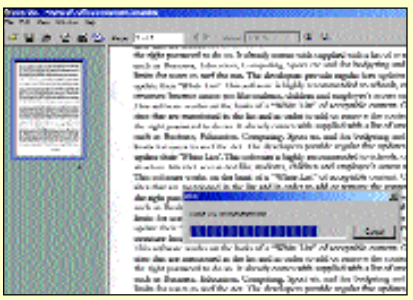
OCR with Office XP

Microsoft Office XP includes a separate program called Office Document Imaging. With this program you can quickly and easily convert a scanned document into text with the optical character recognition (OCR) command.



Installing Office Document Imaging

To access the program, insert the Office XP CD. Select the Add/Remove option and navigate to Office Shared features. Here, select the Office Document Imaging option and continue with the installation process. Once this feature is installed, go to ***Start*** > ***Programs*** > ***Microsoft Office Tools*** and click on Document Imaging. Open the text document which you have scanned, or select Scan New Document if you wish to directly scan it into this program. Now click ***File*** > ***Recognize text using OCR***. This text can then be directly transferred to Microsoft Word.



Office XP's built-in OCR engine does a fairly decent job

SCORE BOARD

Software	ABBYY FineReader 6.0 CE	CuneiForm 2000 Professional	ScanSoft OmniPage Pro 11	XMLCities PageGenie Pro 4.0 SP2	Readiris Pro 7
Features					
Digital Camera Support	✔	✘	✘	✘	✔
No. of Languages Supported	122	20	114	10	93
Page Orientation Detection	✔	✘	✔	✔	✔
Coloured Documents Support	✔	✔	✔	✘	✔
Auto Table Recognition	✔	✔	✘	✘	✔
Scheduling	✔	✘	✔	✘	✘
Batch Processing	✔	✔	✔	✔	✔
Deskew / Despeckle Support	✔✔	✘✘	✔✔	✔✔	✔✔
Image Formats Supported (before OCR)	BMP, TIFF & JPEG	TIFF & JPEG	BMP, TIFF & JPEG	BMP & TIFF	BMP, TIFF & JPEG
Export Formats (after OCR)	DOC, RTF, TXT, HTML, PDF & XLS	DOC, RTF, TXT, HTML & XLS	DOC, RTF, TXT, HTML, PDF & XLS	RTF, HTML & PDF	DOC, RTF, TXT, HTML, PDF & XLS
Text Search and Indexing	✔	✘	✔	✘	✔
Image / Text Splitting Tool	✔	✔	✔	✘	✔
Text to Speech	✘	✘	✔	✘	✘
Resource Utilisation					
Memory consumption	18.8 MB	11.2 MB	25.1 MB	2.6 MB	2.2 MB
Install size	181 MB	40.1 MB	64.6 MB	22.6 MB	20.5 MB
Ease of Use					
Auto Processing	✔	✔	✔	✘	✔
Self Explanatory Icons	✔	✔	✔	✔	✔
Menu Navigation (Scale of 5)	4	2	4	3	4
Wizards (Scale of 5)	4	3	4	0	4
Help and Documentation (Scale of 5)	5	3	4	3	5
Online Help	✔	✘	✔	✔	✔
Performance					
Accuracy (%)					
Inkjet Printout	99.05	98.11	99.29	92.92	97.88
Photocopy	95.75	49.76	92.92	39.15	62.73
Dot Matrix Printout	95.28	23.82	91.03	34.9	79.48
Type-written Document	86.25	47.32	95.99	29	29
Fax Document	97.16	77.83	95.75	83.72	72.87
Excel Spreadsheet	94.47	31.49	90.1	0	62.08
Newspaper Clipping	96.88	87.15	97.27	84.43	96.49
Magazine Page	99.86	88.1	96.21	88.64	92.21
Combi Document	96.77	69	76.53	81.23	84.75
Formatting (Scale of 5)					
Inkjet Printout	4.26	1.42	2.84	1.42	4.26
Photocopy	3.32	0	4.15	1.66	0
Dot Matrix Printout	2.49	0	2.49	1.66	1.66
Type-written Document	4.75	2	4.5	0	5
Fax Document	1.66	0	2.49	1.66	0
Excel Spreadsheet	3.75	0	3.75	0	0
Newspaper Clipping	3.55	0	2.13	0	0
Magazine Page	4.98	0.83	3.32	2.49	3.32
Combi Document	2.5	0	0	0	0
Overall Score					
Performance (50%)	41.52	19.75	38.42	20.32	27.16
Features (20%)	18.5	9.67	16	11	17.5
Ease of Use (10%)	9.2	5.4	7.8	3.8	9.2
Value for Money (20%)	6.86	13.04	6.21	18.07	18.05
Overall Product Score	76.08	47.86	68.43	53.19	71.91
Overall Grade	A-	C+	B+	B-	B+
Vendor	Netspider	Cognitive Technologies	ScanSoft	XMLCities	Irislink
Contact	sales@netspiderindia.com	sales@cognitive.ru	vanessa.richter@scansoft.com	sales@xmlcities.com	sales@irislink.com
Web site	www.abbyy.com	www.cgntv.com	www.scansoft.com	www.pagegenie.com	www.irislink.com
Price (Rs)	25,000	6,450	25,000	4,950	7,068

up. We also observed whether the OCR software could pick up the custom font used for the company logo.

In this test OmniPage Pro 11 scored a whopping 97.27 per cent accuracy, beating ABBYY FineReader 6.0 CE (96.88 per cent) by a small margin. However, FineReader 6.0 CE retained the layout much better than OmniPage Pro 11. It was able to show the reverse fonts and even detected the bulleting as it was on the newspaper clip. It scored 3.55 as against 2.13 scored by OmniPage Pro 11.

Magazine page: A typical magazine page with coloured background, coloured fonts, images and reverse fonts was OCRed. We looked for accuracy in picking up text written in different font sizes, and the ability to retain colour and layout. The layout consisted of three text columns, one coloured block with images and text on it and a company logo in a custom font.


Feeds for thought

Brand extensions

Digit CALENDAR OF EVENTS

Magazine page

Since the magazine page was on high quality paper, most OCR software scored over 80 per cent accuracy, but logged poor scores in retaining formatting. ABBYY FineReader 6.0 CE clearly proved its supremacy over other OCR software, scoring 99.86 per cent accuracy and an almost perfect 4.98 out of 5 for formatting. It retained the layout as well as the reverse fonts with images and the exact company logo.

Closely following it was once again OmniPage Pro 11 scoring 96.21 per cent in accuracy.

Type-written document: Type-written sheets usually contain a lot of letters

Decision Maker		
You are a	Corporate/Government/ Educational Institution	SoHo/Home User
You need to OCR	Faxed/photocopied/type-written documents/newspapers and magazines/contracts/tenders with text and tables, with high levels of accuracy	Documents containing text and tables with basic formatting, occasional newspaper and magazine clippings, with average accuracy
Our pick	OmniPage Pro 11, ABBYY FineReader 6.0 CE	PageGenie Pro 4.0, Readiris Pro 7
Price	Rs 10,000 and above	Up to Rs 10,000

that are misaligned or even not clearly formed. It therefore becomes difficult for the OCR engine to recognise the characters and it has to guess the correct letter or number.

OmniPage Pro 11 scored the highest here, returning an amazing 95.99 per cent accuracy. This score was way ahead of that logged by FineReader 6.0 CE, which managed only 86.25 per cent accuracy. OmniPage Pro 11 also managed to retain the layout fairly accurately, with only two bullet points missing out of 10.

Readiris Pro 7 was the best at retaining format and layout here—it retained the layout with 100 per cent accuracy. But it returned a paltry 29 per cent accuracy in reading the text.

What it all leads to...

It was a tough fight between ABBYY FineReader 6.0 CE and OmniPage Pro 11 all through the test. Both are priced at Rs 25,000 and score well all across the board. Nonetheless, ABBYY FineReader 6.0 CE edges ahead purely because of its ability to retain layouts and formatting across a wide range of media types.

The area where ABBYY FineReader 6.0 CE really shows its mettle is in the combi document—it was the only software to retain all the formatting and styling elements along with an accuracy score of over 96 per cent!

If you can afford it, FineReader 6.0 CE is the best OCR software bar none!

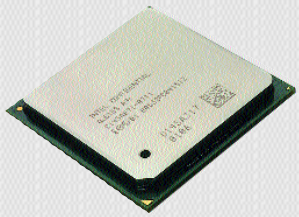
HATIM KANTAWALLA and ALIASGAR PARDAWALA

Bazaar

We test the latest and the best hardware and software products available in the market

Intel Pentium 4 2.53 GHz

Speed demon



If you crave for nothing but the best, then this processor is for you. This speed demon demolished every benchmark we threw at it. It runs at a super-fast speed of 2.53 GHz, screaming along at a quad-pumped FSB of 533 MHz. This P4 is based on the Northwood core—thus featuring 512 KB of full speed L2 cache, resulting in faster gameplay and multimedia. It zoomed past all our previous records and screamed into our hall of fame as the first one to shatter the 400 fps barrier in the normal quality mode in *Quake III*.

It also scored a massive 115.8 in Content Creation Winstone 2001 and scored an equally impressive 106.2 in Business Winstone 2001.

To put things in perspective, a Celeron 400 would score only 19.3 in Content Creation and 17.7 in Business Winstone 2001.

Its ability to crunch numbers depends on the system bandwidth, which can only be satisfied by an RDRAM-based board and a top-of-the-line graphics card. This processor is recommended only for users with stout hearts and deep pockets.

SPECIFICATIONS

Pentium 4 2.53 GHz, 512 KB of L2 cache, SSE2, 533 MHz FSB, 0.13 micron fabrication

Intel Pentium 4 2.53 GHz	B+
Performance	
Build quality	
Value for money	
Features	
OVERALL	

Price: Rs 38,220
Contact: Nebula Technologies
Phone: 022-6730567
Fax: 022-6730566
E-mail: pradip@nebulatech.com
Web site: www.intel.com

Philips Fisio 820 cell phone

Small, sleek and ready for the future

The Philips Fisio 820 sports a contoured body, weighing only 85 grams and features a colour display screen (256 colour, 120x130 pixels with 9 lines). You can adjust different settings such as contrast and backlight. It features an e-mail client with picture attachments, along with voice dial and voice memo. It also supports WAP 1.21, Bluetooth and GPRS.

It lets you store up to 500 numbers in the phone book, 10 dialled calls, 10 received calls and 10 missed calls. Through the menu you can change wallpapers, screensavers or screen themes according to your choice. It also has a feature called quick settings, through which predefined settings such as car, silent and meeting can be quickly applied. The buttons of the phone are quite well placed but they feel a bit tacky and need some getting used to. However, the voice reception, both inside and outdoors was dissapointing. Strangely, the handset that we received would switch off whenever we tried to read an SMS message. All in all, a very expensive phone for the performance it offers.

SPECIFICATIONS

Dual band (GSM 900/1800), 256-colour display, 5 hours 30 minute talk time, 1.21 WAP-browser, GPRS-enabled
Dimension: 98x47x21 mm, 85 gm

Philips Fisio 820	B
Performance	
Build quality	
Value for money	
Features	
OVERALL	

Price: Rs 21,995
Contact: Philips India Ltd
Phone: 011-3731046
E-mail: rishi.goyal@philips.com
Web site: www.phillips.com

SoftWriting CharacTell 3.2

ICR this!

ICR software goes a step beyond OCR—it not only recognises print characters, but also handwriting and converts them into editable documents. During our tests with SoftWriting CharacTell 3.2 using simple handwriting samples (the characters were separated from each other and capitalised) it showed an accuracy of 96.97 per cent. But the software still has a long way to go to make it useful as its accuracy for recognising running handwriting is not so reliable as we discovered when we tested the software with freestyle handwriting—its accuracy dropped down to a lowly 10 per cent! On a positive note, the product can learn as it is used more often—this is a time-consuming task, worth its while if you want the software to operate with reasonable accuracy.

SPECIFICATIONS

Supported languages: English, Spanish and German
System Requirements: Windows 95/98/Me/2000/NT 4.0, Intel 486 or faster processor, 20 MB disk space, 32 MB RAM

SoftWriting CharacTell	B
Performance	
Ease of use	
Value for money	
Features	
OVERALL	

Price: Rs 9,980
Contact: Questa Software Systems Pvt. Ltd "Netspider"
Phone: 022-8633514
E-mail: sales@netspiderindia.com
Web site: www.netspiderindia.com

IBM Deskstar 120GXP hard disk

For all your data storage needs

IBM ruled the performance segment with its 75GXP series and now its 120GXP promises to take that legacy to new heights. This is a 120 GB drive (40 GB per platter) mainly targeted at high-end desktop systems and entry-level workstations. The drive was tested using HDTach 2.61 on a Pentium 4 2.4 GHz powered machine along with 256 MB RDRAM. Its scores were average, with a sequential read score of 38 Mbps and 24 Mbps for sequential write speed. The sequential write speed is fairly low and we were quite disappointed with the effort—an average 7,200-rpm drive scores over 35 Mbps for sequential read/write scores. The CPU utilisation for the drive when tested with the high-end disk Winmark 99 was 9.58 per cent,

which is again a little on the higher side for drives of this class. The average access time of the drive was also higher at 12.1 ms, which is 4 ms higher than the rated 8.5 ms. The drive gets very hot while in operation and it would be advised not to cram it in an overcrowded cabinet without adequate cooling as it could damage the drive due to excessive heat.

SPECIFICATIONS

120 GB, ATA/100 7,200-rpm drive, 2 MB buffer

IBM Deskstar 120GXP	B
Performance	
Build quality	
Value for money	
Features	
OVERALL	

Price: Rs 16,500
Contact: Wales Technology
Phone: 022-3828100
E-mail: sales@walestechnology.com
Web site: www.ibm.com

StepUp 1.6

Data migration

This software from Techno Pundits promises a fast and reliable way of migrating data, applications and settings between PCs.

This program is ideal for users who can't remember or redo all of those complicated settings or use floppies to move data. In order to transfer the data, you will require a parallel port with a parallel cable or an Ethernet card with a direct crossover cable. Unfortunately, this version cannot transfer data with a USB crossover cable. The migration process is Wizard-driven where you will have to select the type of connection you are using and the components you want to migrate. This software gives you two migration options: Mass Migration and Selective Migration. The Mass Migration option allows you to migrate all the components, i.e. supported and unsupported applications, from the source PC to the destination PC. Hence, it is very likely that some of the migrated applications not supported by this version may not function as desired. On the other hand, Selective Migration gives the user the flexibility of selecting the components to be migrated. For ease of use, the settings are organised into four groups: desktop, network settings, applications and data explorer.

Overall, the software is easy to use and is invaluable to those who frequently change setups or to system administrators who want to replicate system settings across a network. However, this program has certain limitations such as the absence of support for Mac machines or DOS-based applications.

SPECIFICATIONS

System Requirements: A P-II processor or above, 64 MB RAM or more, 45 MB of hard disk space, parallel port or network card with UTP interface

StepUp 1.6	A-
Performance	
Ease of use	
Value for money	
Features	
OVERALL	

Price: Rs 1,223
Contact: Techno Pundits Systems Private Ltd
Phone: 044-6524327/28
E-mail: vanitha_gopalan@technopundits.com
Web site: www.technopundits.com

ADCOM DG-300 TOY-CAM

Just point and click

The DG-300 TOY-CAM has a radical shape and supports a maximum resolution of 640x480. It sports 8 MB of memory with a USB 1.1 interface, which makes connecting it to the PC easy and fast. The captured image is around 225 KB in size, and 36 images can be stored on average. Strangely, the camera allowed only 26 images to be clicked in one go when we tested it! We could not get past this limitation despite trying to use a lower resolution of 320x240. The image appeared grainy when uploaded on the PC using the bundled software. ZLink Photo123 allows the user to add effects to the image such as distort image, pentagon filter and cubic photo. The shape, however, is very awkward, which makes taking pictures a tad difficult for users with big hands and the button placement makes it difficult to keep your hands stable while clicking. The camera runs on two AAA batteries when detached, and when connected to the PC, it draws the power directly from the USB interface. It's capable of capturing video at five different settings (640x480, 352x288, 320x240, 176x144 and 160x120 pixels). The rubber stand provided with the camera doesn't provide enough grip and causes the camera to drift when the cable is stretched. The camera is good for younger users and makes for a fun birthday gift.

SPECIFICATIONS

300 K pixel CMOS sensor, 8 MB built-in memory, USB 1.1 compliant, maximum resolution of 640x480

ADCOM DG-300	B-
Performance	
Build quality	
Value for money	
Features	
OVERALL	

Price: Rs 4,600
Contact: Advantage Computers India Pvt Ltd
Phone: 022-8260215
Fax: 022-8258335
E-mail: advantagetime@vsnl.net
Web site: www.advantagetime.com

Sony CRX85U CD-RW/DVD-ROM combi drive

Write said Fred!

The Sony CRX85U combi drive can write data on CD-RW at speeds of 20x and read DVDs at a maximum speed of 8x. The drive has support for the USB 2.0 interface and comes bundled with a rather unusual interface cable—basically a USB to ATAPI conversion cable. The drive is powered by an external power source, which makes it cumbersome to carry around. The drive is very slim and light, and the lid can be opened only when it is powered. In an un-powered state, the lid can be opened by using the manual eject switch located underneath the drive.

The drive took 9 minutes 14 seconds to burn a 700 MB CD-R with assorted data. This is slower than an internal IDE 16x CD-Writer. It's equipped with an 8 MB buffer, which is sufficient to eliminate errors while burning at speeds as high as 20x.

The CRX85U comes bundled with B's Recorder Gold that makes the task of burning CDs very easy, even for new users. The package also contains B's Clip for simple file copy operations along with VideoImpression and PhotoBase for video and image editing. Sony has also bundled Retrospect backup software, which lets you backup your hard disk data onto a CD.

SPECIFICATIONS

20x CD-R, 8x CD-RW, 8x DVD-ROM, 24x CD-ROM, 8 MB onboard buffer, USB 2.0

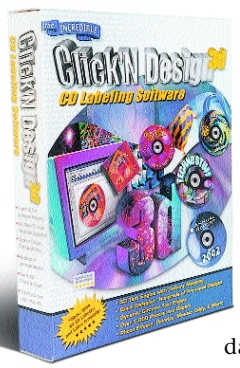
Price: Rs 30,000
Contact: Rashi Peripherals P Ltd
Phone: 022-8260256/59
Fax: 022-8221012
E-mail: ho@rptechindia.com
Web site: www.sony.com

Sony CRX85U	B
Performance	
Build quality	
Value for money	
Features	
OVERALL	

Click'N Design 3D

Design-yer label

Click'N Design 3D is a comprehensive CD label and jewel case label designer. It allows you to create and design professional looking CD labels and jewel case labels with minimal effort. This application has built-in, ready-to-use images and you can create 3D text with different colour effects. You can also add different effects such as Emboss and Oily to the 55 different images bundled in addition to custom images. An important functionality that is built into this software is its ability to create barcodes using different standards predefined within the software—just type the text and the barcode will be generated automatically! The software has a very simple and intuitive interface, with self-explanatory icons. Click'N Design 3D is a good choice for CD authoring houses and software developers who create different CD/DVDs and other such storage media.



SPECIFICATIONS

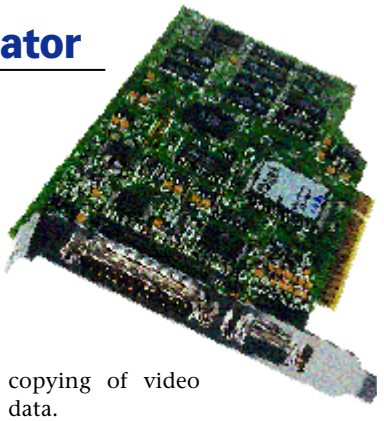
System Requirements: Windows 95/98/Me/2000/XP, Pentium 200 MHz or faster processor, 32 MB RAM (64 MB recommended), 25 MB free disk space

Price: Rs 2,250
Contact: Microware Computer Services
Phone: 022-8729725
Fax no: 022-8727446
E-mail: sales@mwcdrom.com
Web site: www.stompinc.com

Click'N Design 3D	B+
Performance	
Ease of use	
Value for money	
Features	
OVERALL	

MONARCH FX Creator

The FX effect



The FX Creator is an audio-video mixer, developed in India by Monarch Video Vision. It works flawlessly and comes complete with both the hardware and software required for real time audio and video mixing. The package allows you to perform complete audio and video editing and mixing just like any electronic audio-video mixer. The software is fairly easy to operate and comes with a very informative demo that demonstrates the software's working. Surprisingly, these demos are in Hindi and are narrated well, with every aspect of the software explained in complete detail.

FX Creator comes with four video inputs (two each for composite video and S-Video), you also have four stereo audio mixers with one mike input and two stereo outputs for online audio mixers. It can output at a broadcast quality resolution of 720x576 with a two-channel digital timebase corrector that enables faithful copying of video data.

FX Creator is extremely useful for videographers and post-production studios. It is rated to run on a system with a Pentium 133 MHz or higher processor, 128 MB RAM and a minimum of 10 GB hard drive space. We found this reference system slow for its applications but it ran well when we used a 1.5 GHz processor with 256 MB RAM. The product also comes with a one-year replacement warranty.

SPECIFICATIONS

4 video inputs, 4 channel stereo audio mixer, 2 graphic inputs, 2 video outputs, 2 channel digital video mixer with 2 full frame TBCs and 2 channel video processor for brightness, contrast and saturation

Price: Rs 78,000
Contact: Monarch Video Vision
Phone: 022-2619022/2705555
Fax: 022-2618706
E-mail: viren@bom2.vsnl.net.in
Web site: www.monarchvision.com

MONARCH FX Creator	B+
Performance	
Build quality	
Value for money	
Features	
OVERALL	

Blue Eye USB 2.0 portable hard drive

All that you can't leave behind

The Blue Eye portable hard drive is a USB 2.0 compliant drive that fits into your shirt pocket. It draws power from the USB interface and is virtually silent while operating. The drive specifications clearly state that it is a USB 2.0 compliant device; yet it failed to operate on a variety of motherboards supporting this standard.

The drive was consistently detected as a generic USB 1.1 drive and the scores for data transfers were quite abysmal. When a single 711 MB data file was transferred, it took about 11 minutes 57 seconds, equating to a data transfer rate just under an MB per second. The drive is available in 5, 10, 20, 30 and 40 GB capacities. Since the drive is available in larger capacities, the USB 2.0 functionality becomes all the more critical when working with large files. You may want to wait for newer drivers that enable the USB 2.0 compliance before purchasing the drive.

Apart from this limitation, it is a good portable solution and will lend itself well to users who have to transfer files from place to place on a daily basis in a rugged and compact form factor.

SPECIFICATIONS

USB 2.0 compliant, available in 5, 10, 20, 30 and 40 GB capacities

Blue Eye USB 2.0	B
Performance	
Build quality	
Value for money	
Features	
OVERALL	

Price: Rs 16,500 (for 30 GB)
Contact: Wales Technologies
Phone: 022-382 8100
E-mail: sales@walestechnologies.com
Web site: www.ibm.com

Frontech Gold JIL-7050 Smart Office keyboard

Keyway to the Web

Frontech Gold Smart Office keyboard is the next step in the natural evolution of a peripheral that is central to computing. It provides additional keys for Internet browsing and Microsoft Office applications. A user can perform standard browsing functions such as refreshing a page and navigating forward and backward between Web pages with the special keys provided on the keyboard. For the music maniacs, this keyboard provides buttons for complete volume controls as well as mute functions right above the numeric keypad. It also has keys for the standard audio functions such as play, stop, next track and pervious track and works well with Winamp.

Installation of the keyboard is simple. Just attach the keyboard to your machine, put the installation CD in your CD-ROM drive and load the drivers. Having done that, you have full control over the keyboard's various buttons.

A nifty joystick type of cursor controller is also offered, which substitutes the functions of arrow keys but takes some time getting used to. However, the keyboard poses a disadvantage for typists who are used to hitting the [Spacebar] right in the middle—the middle section of the [Spacebar] is thin (this is where the joystick is located), making it a little awkward. Other than these minor nags, this is a very utilitarian keyboard and is relatively well priced.

Price: Rs 1,700
Contact: Jupiter Infosys Ltd
Phone: 022-2001211
Fax: 022-2001214
E-mail: frontech@bom2.vsnl.net.in
Web site: www.frontechgold.com

SPECIFICATIONS

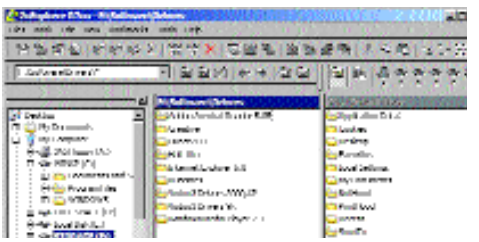
PS/2 keyboard

Frontech Gold JIL-7050	B
Performance	
Build quality	
Value for money	
Features	
OVERALL	

2xExplorer 1.3.1.12

Replacement file manager

2xExplorer is a file manager that combines the ease of the standard Windows explorer with the functionality and speed of an old school dual-pane file manager. 2xExplorer scores over Windows Explorer with its more sophisticated viewing filters and a beefed up file search tool. It has an in-built viewer that works with many popular graphics formats as well as HTML and Office documents and a file and folder shredder that ensures the complete destruction of any file you wish to delete. Another feature that we found very useful is its ability to print listings of folder contents.



However, getting the hang of all these features does take some time. Users will need to memorise the many shortcut combinations before they can really benefit from this package. Configuring the toolbars takes a while initially, but is definitely worth the time spent. What really makes this software special is the fact that most tasks are just a shortcut away, boosting the speed at which the work is done. It provides support for bookmarks and Internet-style back/next folder navigation, as well as auto-completion for paths and other frequently typed information.

It is a good choice for power users and those who are just looking for simplicity. Plus it's completely free and takes up very little system resources, making it definitely worth the install.

Price: Freeware
Web site: www.netez.com

SPECIFICATIONS

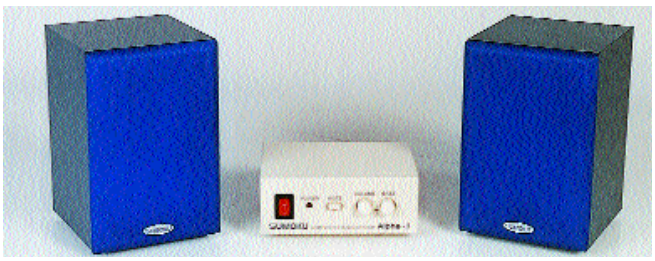
Windows 95/98/Me/2000/XP

2xExplorer 1.3.1.12	B+
Performance	
Ease of use	
Value for money	
Features	
OVERALL	

SUMOKU Alpha-1 desktop speaker

Vibrant music

SUMOKU Alpha-1 desktop speaker from Palesha electronics is a relatively new name in the speaker market. This desktop speaker looks distinctly different from the general lot of speakers. Its body is made of wood with sharp edges. The front cover is dark blue with hardly any design appeal. The set comes with a simple stereo setup (right and left satellites and a separate amplifier). The speaker can be plugged to the amplifier unit, which is a bit heavy.



This unit has a simplistic front panel comprising of a power button, power LED, volume and bass controls on the front panel. The sound quality produced by the speaker was pretty decent with good treble and midrange reproduction. Bass reproduction was average and this could be attributed to the fact that it has no subwoofer and employed full range satellites to reproduce the entire audio frequency range. There was a perceptible distortion when heard at full volume, especially with high frequency sounds. The speaker is recommended if you want a desktop audio solution with decent sound at a very affordable price.

SPECIFICATIONS

7.5 cms paper cone, 5 watts RMS and frequency response of 50 Hz to 15 KHz

Price: Rs 950
Contact: Palesha Electronic Industries
Phone: 9120-6355702
Fax: 9120-6353861
E-mail: palesha@vsnl.com

SUMOKU Alpha-1	B+
Performance	
Build quality	
Value for money	
Features	
OVERALL	

Browser Lock 7.30 Home Edition

Safety Net

With Internet usage spreading so widely among corporate and educational institutes, it becomes imperative to keep a check on Internet activities. Browser Lock is a solution that provides a combination of both a personal Internet portal (you can create personal maps for users to navigate the Internet) and a Web access filter, thereby allowing users to block access to unacceptable content. This software works on the basis of a 'White List' of acceptable content. You will only be able to browse to those sites that are mentioned in the list and in order to add or remove the contents from the list, you will have to supply the right password. It already comes with a list of over 7,000 sites categorised as business, education, computing, sports, etc. For auditing purposes, one can set time limits for users to surf the Net and log usage. The developers provide free regular updates of acceptable URLs, which allow the users to update their 'White List'.

This software is highly recommended for schools, colleges and corporate institutions which would like to monitor and restrict Internet access.

SPECIFICATIONS

System Requirements: Windows 95/98/Me/2000/XP, Pentium processor and 32 MB RAM, 10 MB free disk space

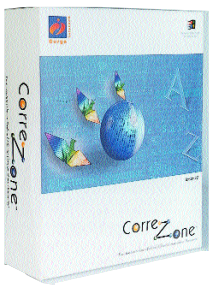
Price: Rs 2,498
Web site: www.browserlock.com

Browser Lock 7.30	B
Performance	
Ease of use	
Value for money	
Features	
OVERALL	

CorreZone 2.0

Correspondence zone

CorreZone is a correspondence management software designed especially for users who have to draft a number of mails and letters on a daily basis. It comes along with a hardware lock, which has to be installed for it to work. The hardware lock is attached to the parallel port, but at the same time provides another parallel port for alternative uses.



CorreZone allows you to classify your correspondence in various customised or predefined categories (customer correspondence, bank correspondence, business correspondence, etc). The package also has bulk mailing functionality integrated—with one single operation you can print/fax/mail the same letter to multiple recipients.

The software supports Microsoft Access, Microsoft SQL Server, Oracle and MSCDE databases, and uses them as its backend for archiving and retrieving data. Other features include inter-office memos, letter drafting functionalities, phone diallers and an interoffice chat client.

The software is easy to use with a function-driven menu structure. It also comes with a detailed manual and a step-by-step 'install and use' guide. Coordinators, PR managers and executive secretaries will find it very useful. A single user license is available for Rs 9,500, which does seem a tad expensive, if you don't use it on a regular basis.

SPECIFICATIONS

Windows 95/98/Me/2000/XP, Pentium 166 MHz, 32 MB RAM 75 MB hard disk space

Price: Rs 9,500
Contact: Durga Infotech
Phone: 044-6440414
Fax: 044-8727446
E-mail: support@correzone.com
Web site: www.correzone.com

CorreZone 2.0	B+
Performance	
Ease of use	
Value for money	
Features	
OVERALL	

Mission: Input Devices

Agent 001 scours the streets in search for a keyboard and mouse

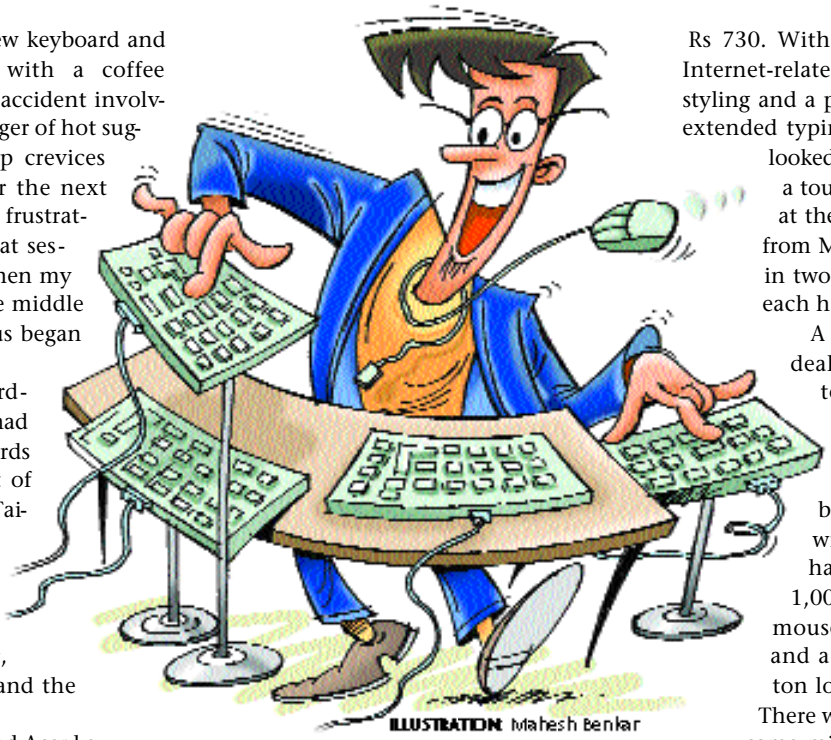


ILLUSTRATION Mahesh Benkar

My quest for a new keyboard and mouse began with a coffee mishap, a fatal accident involving the unscheduled merger of hot sugary liquids and the deep crevices inside my keyboard. For the next two days I had the most frustrating and embarrassing chat sessions with my friends. Then my mouse died on me in the middle of a gaming session. Thus began Mission: Input Devices.

Even the smallest hardware store in my suburb had a variety of cheap keyboards and mice. There's a glut of brandless Chinese and Taiwanese mice available for as low as Rs 120. I personally hate these cheap Chinese makes. They aren't ergonomic, have no scroll features, and the buttons feel tacky.

The basic Samsung and Acer keyboards were rated *'sasta* and *tikau'* by a dealer in Andheri, Mumbai, and were among the most affordable keyboards I came across. While these keyboards did not have any extra features such as additional shortcut keys, at Rs 500 and 300 respectively, I didn't expect anything more. I liked the way the keys felt soft and responsive and they didn't make too much noise—that's all I wanted from a keyboard.

A dealer in Borivili, Mumbai, had a stack of iBall mice in different colours. I liked the iBall mouse—it's a good buy for 400 bucks and it can scroll vertically and horizontally with acceptable precision. The PS/2 Logitech scroll mouse, selling at Rs 650, was rated a hot item according to him. It's versatile, durable, accurate and ergonomic. I highly recommend it for its price.

If you want a multimedia keyboard with shortcuts to the Internet and multimedia applications, try the Maple Internet Media keyboard—it features a good layout and includes 15 programmable keys along with eight exclusive function keys—all for a cheap Rs 775. I also took a liking to Logitech's Deluxe Access 104 keyboard for Rs 730. With quick access buttons for Internet-related tasks, an ergonomic styling and a palm rest that helps during extended typing sessions, this keyboard looked like a good buy. If you are a touch typist who doesn't look at the keyboard, try the EKB804 from Maple—the keys are divided in two halves for easier access by each hand.

A little later I came across a dealer who only stocked A4-tech mice—double scroll mice, five-button mice, trackball mice, infrared trackball mice with scroll buttons, radio frequency wireless trackball mice—he had them all at under Rs 1,000. The WWT 5E trackball mouse with two scroll wheels and a programmable third button looked tempting at Rs 800. There were prettier versions of the same mice too, with a translucent iMac-like design for Rs 100 extra.

While optical mice are more expensive than conventional mice, they are durable and long-lasting since they have no moving parts and can be used on any surface. Their prices have fallen over the last few years—the Logitech White Optical was only Rs 1,200, while the WOP35 from Maple was available for Rs 1,100. And if you go in for a keyboard and optical mouse combo, you could get them both for less than Rs 2,000—a steal if you ask me.

The Cordless Freedom Optical keyboard and mouse combo from Logitech is the ultimate combination. There are no cords, the keyboard has Internet and multimedia keys that allow you to connect to the Net and control MP3s, DVDs and CDs, and the optical mouse is ergonomically designed (although it's more suited to right-handers). However, at Rs 8,000, this combination is certainly not for everyone. I drooled over the trackball mice from Logitech—it's the lazy man's pointing device that needs only the twiddling of the fingers with no wrist work and is very comfortable to use once you get used to it. But it's expensive at Rs 5,000.

After doing the rounds of the marketplace, I looked in my wallet, and finally settled for the Samsung keyboard and the iBall mouse for Rs 800—after a little bargaining, of course.

SHOPPING TIP

- Do not buy the mouse if the mouse ball is hollow and light; it translates into poor movement.
- Consider yourself to be the Joe Satriani of touch typing? If you never look at the keyboard while you type, you qualify. Buy yourself a natural keyboard, where the keys are divided from the centre at an ergonomic angle to make touch typing easier.
- Optical mice are more expensive than PS/2 mice, but they are very durable since they have no moving parts. Plus they are more accurate.
- Buy a keyboard with wrist support—it will help you during extended typing sessions.
- Suffer from calloused wrists? Buy a trackball mouse, you will never have to move your hands again—just your fingers!
- Infrared or radio frequency cordless mice are ideal if you yearn for an uncluttered desktop.
- PS/2 mice are more responsive than serial mice as you can tweak them to operate at a higher refresh rate and are definitely recommended for gaming.

INTERNET ON

Of the many wireless technologies mushrooming around us, GPRS may be the most important for wireless communications

From cordless phones to mobile phones, wireless communication has seeped transparently into our daily lives. Wireless technologies have far reaching applications but have gained popularity and acceptance only in the field of voice communication. Wireless data access such as sending memos, exchanging e-mail, scheduling appointments, etc is still not widespread, largely due to very slow connection speeds. Even the development of the Wireless Application Protocol (WAP) hasn't helped much—you cannot browse existing Web sites or access your data until they are converted to the WAP format.

General Packet Radio Service (GPRS) is the first wireless service that addresses the need to access any information at all times. It provides an always-on connection to the Internet and works with existing Internet standards, tremendously increasing its applications. GPRS works over the existing Global System for Mobile Communications (GSM) networks, making it easy and inexpensive to set up, since this is used by most mobile service providers today.

Other mobile service providers use a standard called Time Division Multiple Access (TDMA). They are also tilting towards GPRS with a wireless technology called Enhanced Data Rates for Global Evolution (EDGE). EDGE and GPRS are both based on similar infrastructure and protocols, except that EDGE uses a more sophisticated radio interface.

The family tree

Cellular technologies have come a long way since their birth, evolving in phases called Generations (G). Each generation takes the technology a step further, providing exponentially higher data rates and better bandwidth efficiency, and allows the possibility of more mobile applications.

Second generation (2G) protocols include GSM, TDMA and CDMA (Code Division Multiple Access), and use digital encoding. The 2G network protocols support voice and some limited data

communications such as fax and SMS, and offer different levels of encryption and security. These protocols are primarily used for voice communication over mobile phones.

GPRS marks the transition into 2.5G. GPRS is a radio technology for GSM networks that adds packet-switching protocols and the possibility for billing by the amount of data sent, rather than connection time. Packet switching is a technique whereby the voice or data is broken up into small chunks of data, which are then routed by the network. EDGE will also be a significant contributor to 2.5G. It is an enhanced modulation technique designed to increase network capacity and data rates. GPRS supports flexible data transmission rates as well as continuous connection to the network, thus making it the most significant step towards 3G.

3G, the Third Generation protocol, is a new network technology being developed for mobile operators. The Universal Mobile Telecommunications System (UMTS) will support much higher data rates, allowing true broadband on mobile devices. 3G networks are already emerging in Japan (NTT DoCoMo is the first 3G network) and some parts of Europe.

2G networks provide about 9.6 Kbps throughput and 2.5G networks increase it to around 56 Kbps. 3G technologies promise upwards of 100-300 Kbps initially, and aim to shoot up to 4 Mbps over time, allowing a range of high-bandwidth multimedia services on mobile devices.

The Good and the Bad

Wireless Technology	Advantage	Disadvantage
GSM	Widespread; devices easily available and economical	Limited applications; maximum bandwidth 9.6 Kbps
GPRS	Easy to upgrade from GSM; many aplications	Devices expensive; not many available yet
EDGE	Easy to upgrade from GPRS; maximum bandwidth 384 Kbps	Devices not readily available; limited bandwidth currently available
UMTS	Data rates up to 2 Mbps; can grow to 4 Mbps	Service not widespread; still under development

Why GPRS tops

GPRS is built over existing standards, both wired (the Internet) and wireless (mobile communications). Hence, its applications are many and implementation is easy. It's fast, secure, packet-based, and has Quality of Service (QoS) features.

So far, most voice communication happens over circuit-switched networks. Because of this, users have to set up a dedicated connection before they can communicate any information. Hence, when you make a phone call from a landline, a single channel is allocated entirely between you and the receiver. Though this is taken care of by the service providers and is completely transparent, it means a huge waste of resources—the channel is locked between two people even when no data is being transferred. With a packet-based service, more users can be supported over the same channel. The most popular packet-based service is the Internet.

Just like dial-up Internet connections, mobile devices will have an IP address, either static or dynamic. IP packets can originate and travel along the entire network, for example, from your PDA to your e-mail service provider. When you send information over the available channel, the packet contains details such as who it is from and who it is meant for. Thus, several packets can travel on the same channel without getting mixed up and reduce the amount of total bandwidth that is required to support multiple users.

There are several speeds at which GPRS is available. The service providers, depending on how much they invest on the infrastructure, can control this. Theoretically, the maximum rate is around 114 Kbps, though initially we would see much lesser speeds.

QoS, another standard network protocol, can be enabled on GPRS and turns out to be extremely advantageous at low speeds. QoS allows priority allocation to certain types of data packets over others. Thus, applications can define the importance of the data and take up only limited bandwidth, freeing up bandwidth for other applications. For example, you can set e-mail to be received at low speeds and use the rest of the bandwidth for videoconferencing.

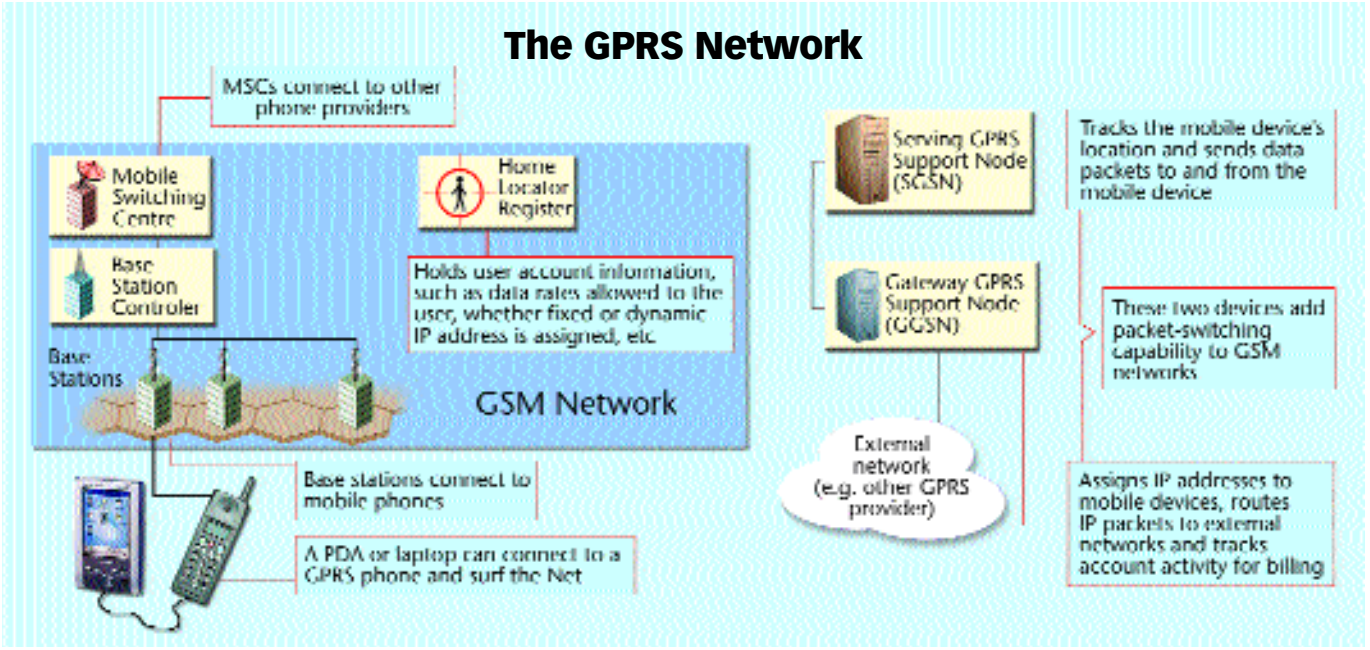
GPRS is also being evolved into much faster standards such as Wideband Code Division Multiple Access (W-CDMA), a 3G wireless standard.

How GPRS works

GPRS works over existing GSM networks. Two devices, the Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN) convert the circuit-switched network to a packet-switched one. When connecting to the Net, either from the phone, laptop or handheld, the phone sends out signals to the nearest base station. The base station relays the data to the base station controller that communicates with the Mobile Switching Centre. The Mobile Switching Centre connects to the GPRS devices via a Home Locator Register, which tells your account profile to the network. The SGSN tracks your location so that it can keep the communication alive. It also compresses and encrypts the data. The GGSN assigns an IP address to the cell phone and maintains your account logs. It can connect you to other mobile networks just like the roaming service on a cellular phone (*see infographic: The GPRS Network*).

GPRS networks use 200 KHz radio

Generations of Wireless Technologies



channels, with each channel divided into eight slots, each of which can support a throughput of 13 Kbps. Theoretically, a user can use all eight slots simultaneously, but service providers are likely to limit the number of download slots to four or less, and upload slots to one, to allow more concurrent users.

Putting it to use

Surfing on a cell phone may not be fun, given the display area, but you can use it to check your e-mail, news and even sports scores. For heavy-duty tasks, you can connect the phone to a handheld or a laptop and use it as a modem, giving you complete access to the Net.

With more bandwidth, broadband applications such as Voice over IP (VoIP) and videoconferencing will be possible. As the service becomes inexpensive, these options will become more viable and may even save on communication costs—you can use an IM or VoIP instead of STD and ISD. GPRS phones already allow you to send SMS messages over the Internet instead of the GSM network, thus circumventing the charge for the SMS.

Security Concerns

Security over GPRS is at various levels. The user must have a Subscriber Identification Module (SIM) card to use the service. The network can request a password using common password protocols. GPRS also encrypts the link. Over external networks, carriers can optionally employ the IPSec protocol. Finally, since communication is based on IP, any security architecture used over IP, such as Virtual Private Networks (VPN), can also be used with GPRS.

GPRS tools

GPRS devices are of three kinds: Class A devices can handle voice and data simultaneously—you can receive a voice call even while IP data is being transferred. Class B devices can handle voice and data sequentially. The network will notify you of an incoming call, but you will have to suspend the data session to accept it. Class C devices can handle only data.

To use GPRS, you need a GPRS-enabled phone that can be connected to a laptop or a handheld and used as a modem as well as a browser. Some of the GPRS-enabled phones available in India are:

Sony Ericsson T68i: This slick phone has an impressive colour display. It supports GPRS, Bluetooth, High-speed Circuit-Switched Data (HSCSD), Triple-band GSM (900/1800/1900), Enhanced Messaging Service (EMS) and WAP 2.0. SyncML synchronises the online calendar and contacts, and the Wireless Transport Layer Security (WTLS) class 3 provides security during mobile commerce transactions.

Siemens S45: It has 360 KB of onboard memory and its internal data formats are compatible with traditional PC formats such as wave, MIDI, text, etc. The S45's high-resolution screen, though monochrome, can accommodate up to seven lines of text and is a boon for browsing on the phone.

Nokia 8310: This is Nokia's first GPRS model, but the five-line display may not be the best for surfing. It also has an FM receiver, but supports only mono audio.

Philips Fisio 820: The colour display makes for better browsing—the phone supports GSM 900 and 1800, GPRS, WAP and Bluetooth.

Footnotes

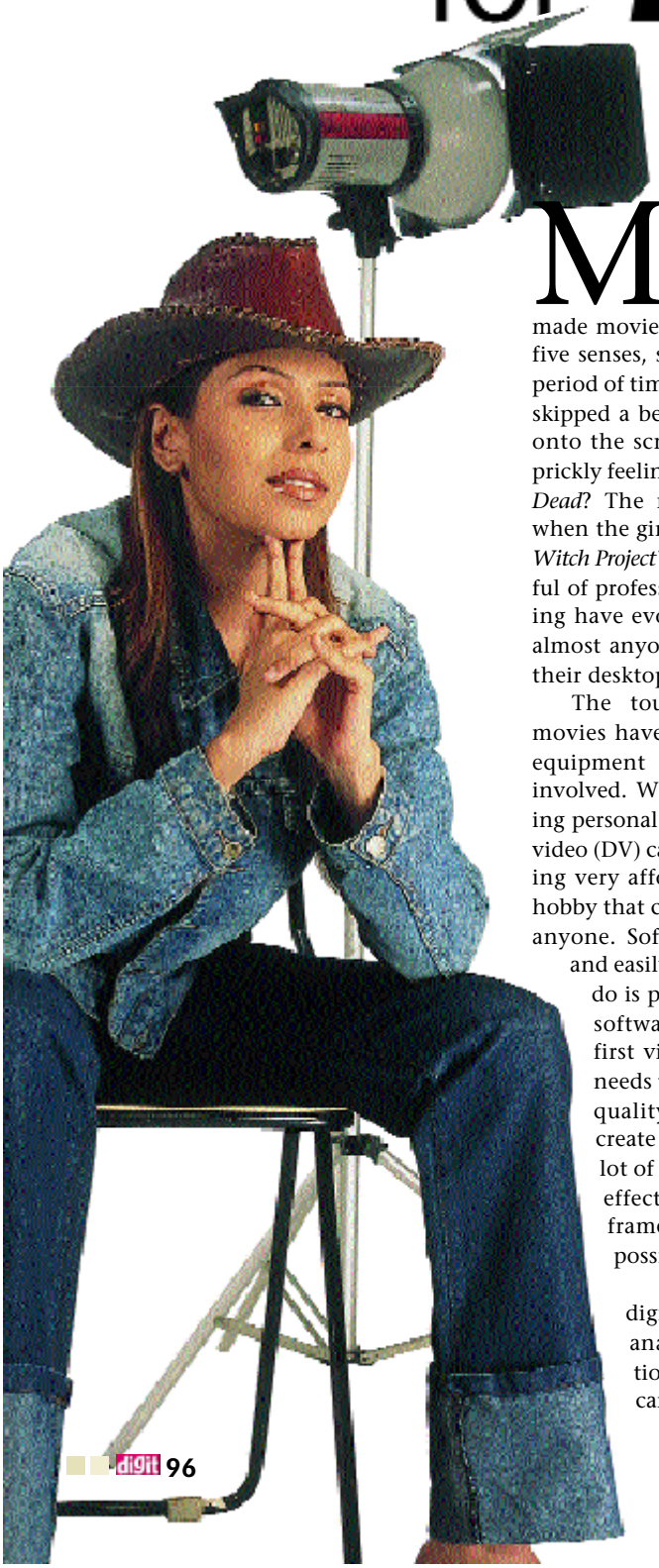
Wireless technologies are fast developing to keep up with the ever-growing needs of mobile users. GPRS can currently give theoretical rates of up to 114 Kbps and this is being pushed to 160 Kbps. EDGE offers far better performance, with a maximum theoretical throughput of 384 Kbps.

The next generation of GPRS, Wideband CDMA, also referred to as the Universal Mobile Telephone System (UMTS), is one of the standards approved as a 3G cellular technology. It provides data rates of 144 Kbps when mobile, 384 Kbps outdoors at pedestrian speeds and 2 Mbps indoors. It uses an entirely new radio technology based on 5 MHz channels, but retains the GPRS architecture and uses the SGSN and GGSN nodes.

The GPRS infrastructure can actually become the core network for 3G systems, supporting a variety of multimedia services including voice, text, digital images and video on mobile devices.

VEER KOTHARI

Make a SCENE for Yourself



Movie making is no longer just a Bollywood business. You don't need professional tools to make magic, just a basic multimedia PC

Movies are probably the most engrossing and popular of all communications and entertainment media. A well made movie is one that enchants all the five senses, suspending reality for a brief period of time. Remember how your heart skipped a beat when the T-Rex thumped onto the screen in *Jurassic Park*? Or the prickly feeling you got while watching *Evil Dead*? The numbness you experienced when the girl screamed away in *The Blair Witch Project*? Once the domain of a handful of professionals, advances in computing have evolved to such an extent that almost anyone can now make videos on their desktop.

The toughest hurdles in making movies have always been the expensive equipment and complicated software involved. We don't need either for making personal videos. With low-end digital video (DV) cameras and Web cams becoming very affordable, making movies is a hobby that can now be enjoyed by almost anyone. Software too is very abundant and easily available. So all you need to do is plug in the camera, install the software and shoot away to your first video. Home video no longer needs to be shaky with poor picture quality—very powerful tools help create the perfect picture and add a lot of cool effects. Transitions, fade effects, sound effects, freeze-frames—all these and more are possible with basic tools.

The biggest advantage that digital video has over the old analogue way is the introduction of non-linear editing—you can cut, copy, paste, delete, add and merge chunks of video just as you would edit a Word document. Also, you don't need to manage piles of video tape. You can preview the video as you capture it and re-take it as many times as you want without worrying about wasting reels of film. Mixing and matching the good parts of all the clips is a breeze.

Your baby boy's first steps or your daughter's third birthday—you can capture these precious moments, burn them onto CDs and cherish them forever, without worrying about dust, fungus, or moisture damaging the video. You can even use video for making presentations and sales pitches—a concept video will certainly make a bigger impact than a slideshow of projection graphs.

Filmy fundas

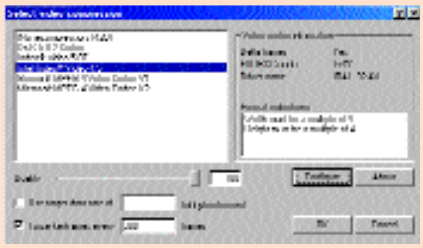
Knowing the basics of digital video is the key to creating smooth, error-free and good quality movies. Here are some things you should keep in mind.

Resolution: Resolution not only determines the height and width of the movie, it also directly affects the movie quality and the file size. Also, at higher frame sizes, more processing power is used, so if the video seems jerky, you should lower this setting. Generally 320x240 is good enough, but you may want to capture at 640x480 if your system allows it.

Frame rate: The frame rate determines the number of frames that make up one second of the video. Thus, higher frame rates mean a better quality video. The human eye perceives smooth motion at a minimum rate of 24 frames per second, so a frame rate of 30 is ideal—it will look smooth and allow for a few dropped frames.

Lights, Camera, Action!

For capturing video we will use VirtualDub with a Web cam. VirtualDub is a very powerful freeware and allows better control over the capture process than most bundled software. Launch VirtualDub and click ***File*** > ***Capture AVI*** to switch to capture mode. You should set the resolution from ***Video*** > ***Format*** before you start capturing. Also, unless you are recording an interview, disable Capture audio from ***Capture*** > ***Settings***. We will capture audio separately and merge it into the movie. Here you can also specify the capture frame rate. Align the camera to set the frame you want to shoot and start capturing by clicking ***Capture*** > ***Capture Video***. Hit [Esc] to stop recording.



Open Video > Compression to choose a codec to compress the captured video

SoundForge 6.0, VirtualDub 1.4.10, Avi Assembler 1.2, DivX 5.02 Codec
Find them in Software > Multimedia on the Mindware CD. Plus, video clips in Surge > Samples on the Playware CD for you to experiment with

Dropped frames: If your PC is slow, it may not process every frame sent by the capture device. To keep up with the incoming video, it simply drops the unprocessed frame and fills it with the preceding frame instead. This appears as jerks in the video. When capturing video, keep an eye on the number of frames dropped to see how smooth or jerky the video will be.

Sound settings: When recording sound separately from the video, you should use high quality settings—record 16-bit stereo sound at 44,100 Hz. Unlike with video, computers today have no problem processing high-quality sound. For the final video, though, scale it down to 8-bit stereo at 22,050 Hz. The sound will still be clear and the files will be much smaller.

Interlacing: Interlacing increases the visible resolution of a video, since two frames interleave to make one image. Interlaced capture with low-end equipment can result in a hazy picture, especially when recording movement. The camera sends two frames sequentially, so the two images that make up one frame on the output may not match. Also, the computer needs to process more frames when capturing interlaced video. Besides, computer-generated graphics are non-interlaced and when merged with an interlaced video, may not render well. Hence, it is a better idea to always use a non-interlaced video.

Special effects: Video editing software such as VirtualDub (***www.virtualdub.org***) allows you to add some basic effects to the video. With a few combinations of filters, you can produce some really interesting effects. Apart from the bundled filters (*see table, 'VirtualDub Filters'*), you can also download a lot of filters from the Internet—***www.virtualdub.org*** itself has a huge list you can choose from. It is best to apply effects filters after you've cleaned up the video or at the last stage when you are generating the final video. The more filters you add, the slower will be the processing, though.

Video compression: Video compression codecs are not perfect—they cannot output exactly the same image as the original. The codec tries to estimate what differences would be invisible to the eye and removes them. The advantage is you can control how big the video file gets by changing its visible quality. Compression artefacts (noise in the video) result from high compression and the amount of noise varies across algorithms.

DivX is the best compression format available. It compresses video to ridiculously small sizes without too much loss in quality. DivX 5, the latest version, uses Variable Bitrate (VBR), ensuring the smallest possible size with the highest possible quality for each frame. Several people have been developing the DivX codec for a while now and it is actually available in many different flavours. The codec can be downloaded from ***www.divx.com***. (*For more information on DivX, refer to Digit, March 2002.*)

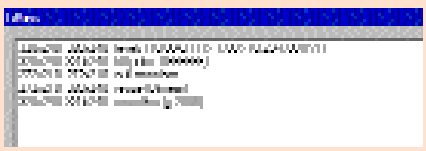
Let there be Light

Beware of Web cams. Most of them dynamically adjust brightness and contrast settings depending on the ambient light. This works well in a static frame, but if you are moving the camera, it can produce a few seconds of very dark or very bright video if the lighting is not even.

On the Editing Table

After the shoot, you will want to edit the video to remove all the unwanted parts and resample the image resolution and quality. VirtualDub displays two panes, one for the source video and the other for the same with filters applied. To cut unwanted frames out from the video, press the [Home] key where you want to start cutting the video and the [End] key where this ends. Hit [Delete] to cut out the marked area.

VirtualDub has a lot of filters to cleanup the video too (*see table, 'VirtualDub Filters'*). Select the portion of the video you want to clean up by clicking ***Video*** > ***Select range***.



Filters in VirtualDub are applied in the order in which they are listed. Rearranging the order may yield totally different effects and also affects the processing time

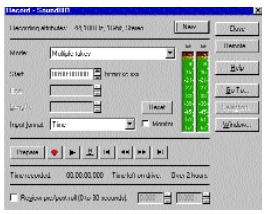
You can add filters to process the video from ***Video*** > ***Filters***. Click Add to add and configure the filters. Each filter will bring up its dialog box where you can configure it. Most of them allow you to preview the effect of the filter on the fly. With each filter you add, the preview will include effects of all preceding filters. You can rearrange the order of the filters once you have added them.

You can also crop the video by clicking the Cropping button. VirtualDub does not allow you to crop a video without a filter, but you can use the Null Transform filter, which does not affect the video at all, but just provides an interface to allow cropping. Once you have set up all filters, click ***Video*** > ***Full processing mode***—the filters will not be applied without this—and save the video.

Mic Testing

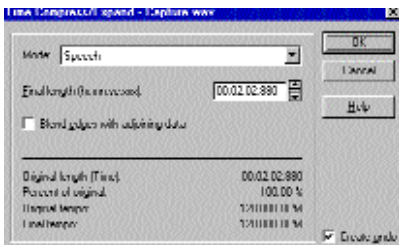
Capturing audio is probably the easiest part of the movie-making process. All you need is a microphone, WAV recording software like SoundForge and a good voice.

Adjust the microphone level from the volume controller until the sound is clear and there is no background noise affecting it. You can also record a clip with variations in pitch and play it back to ensure that it is clear. Launch SoundForge and click ***Special*** > ***Record*** to bring up the recording options. Click the Record button to begin recording.



Set up SoundForge for recording

To delete parts of the captured audio, simply select the range and press [Delete]. The Process menu has some very useful options to enhance the sound. Normalise, Smooth/Enhance, Time Compress/Expand and Volume will



Create a wave file of the same length as the video

be the ones you'll use most often when editing sound for video. Of these, the most useful one is Time Compress/Expand. Ideally, it is best to have a wave file of the exact same length as the video for perfect synchronisation. Once you have finished editing the sound and kept only the parts you require, use this function to expand or compress the length of the track to match the length of the video. You can get the length of the video from VirtualDub.

For accurate audio-video synchronisation, it is best to have a single final wave file. You can work with multiple audio samples, but once you finalise them, merge them all in sequence into a single track. Merging audio files is as simple as a copy-paste operation.

Great Stills

You can add still images, photographs and computer-generated graphics such as graphs or transitions to your video too. For this, we will use a tool called AVI Assembler. Start AVI Assembler and click Add Images. You can select any BMP, JPG or GIF files and add them to the list. Set the FPS, width and height to the same frame rate, width and height of the captured video (say, 30, 320 and 240). Images of different sizes will be automatically scaled to this size. In the box for 'This frame should appear... times', set how many frames each image should span across and click 'Input # times'. Multiply the number of seconds the image should be displayed by the FPS to calculate this value. Click ***AVI Operations*** > ***AVI Parameters*** and set the Pixel Format to 24-bit for best video quality. Click Create AVI and choose where the video should be saved.

Create video from a set of bitmaps

Creating VCDs: For burning VCDs, you will have to encode the video in MPEG-1 format. Though not as good as DivX, VCDs are more widespread and can be viewed on conventional VCD players. The only other way is to create a completely uncompressed video file, which is not only unwieldy, but may also be impossible—just a 10 minute video can take up to 8 GB of disk space!

Going online: If you are looking to host your video on the Internet, do everything you can to get the file size down to the minimum possible. It would also be a good idea to provide videos of different resolutions and quality so that the viewer may choose depending on his bandwidth. Streaming is a totally different ball game. You would need to install a streaming server and encode the files specifically for streaming. Windows XP comes bundled with Windows Media Tools that allow you to create streaming files. PlayStream (***www.playstream.com***) has an impressive set of services for streaming. They can convert and stream video in several formats and though the service is not free, you can get a free trial for 15 days.

Your hammer and nails

You can use various hardware and software to capture and work with digital video. Though digital video (DV) cameras have been around for many years, they have always been unimaginably expensive and used only by professionals. Their prices have reduced over the years, but most are still beyond the reach of amateur enthusiasts. Many digital cameras today provide the added functionality of capturing motion picture. DV cameras afford the best quality and highest amount of control over the capture when shooting a video, but to connect it to your computer, you will also need to invest in an IEEE1394 addon card.

VirtualDub Filters

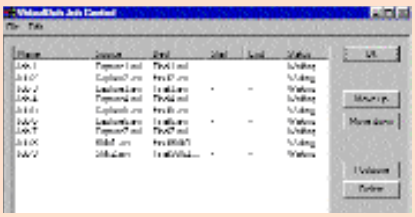
Filter	Purpose
Deinterlace	Outputs a non-interlaced video from an interlaced one
Brightness/Contrast	Adjusts brightness and contrast of the video
Levels	Adjusts colour levels of the video
Resize	Re-samples the image resolution (height and width)
Sharpen	Gives more distinct edges to the picture
Smoother	Smoothens out the image and can remove noise from the video
Box Blur	Adds blurring effects in increasing gradations from the centre to the periphery of the frame
Emboss	Creates a 3D embossed image
Flip Horizontally and Flip Vertically	Flips the image horizontally or vertically
Rotate	Rotates the picture by 90, 180 or 270 degrees
Rotate2	Rotates a video by any specified angle. Areas emptied due to the rotation are filled with a solid colour
Invert	Creates a negative of the image
Motion Blur	Adds a motion effect by blurring successive images together

Putting it all Together

You have video clips, sound and stills ready for the final movie. It's time to bring it all together.

Batch convert: If you have several raw video clips and those made from still images, you need to join them to make the final video. To be able to do this, you will have to ensure that they are all at the same resolution, frame rate and compression. If you need to convert the videos to a single format, you can set up a batch conversion process in VirtualDub.

Set up the video settings and select ***File*** > ***Save as AVI***. Select the box next to 'Add operation to job list and defer processing'.

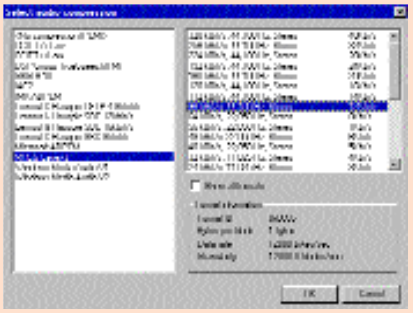


Set up batch processing in VirtualDub

Repeat the same for every file you want to convert. VirtualDub will create a batch file for every job added this way. Open ***File*** > ***Job control*** to bring up the list of jobs. You can delete or postpone jobs from here, or simply click Start to begin converting.

Join video clips: This is the simplest process. Open the first video file in the sequence, then click ***File*** > ***Append AVI segment***. Select the next file and repeat—you can run the entire video as a single file. You can edit it and apply filters the same way as you would to individual files. If you are not editing it, select ***Video*** > ***Direct stream copy***. VirtualDub will simply copy all the frames from the video clips to the output file, and not process each one. This is extremely fast. You can save the video here or jump to the next step of merging the sound.

Integrating sound: Once you have the wave file of the same length as the movie, in VirtualDub click ***Audio*** > ***WAV Audio*** to select the sound source for the video. Click ***Audio*** > ***Full processing mode*** and open



Compress audio when integrating with the video to reduce file size

Audio > ***Compression***. You can select any audio codec to compress the sound, but MP3 is the best as it gives the best quality sound and the highest compression.

You can also adjust the volume level of the audio from ***Audio*** > ***Volume***, though it would be much better to do this in a sound-editing application like SoundForge. When you save the AVI, it will have the sound integrated into it.

One of the first video capturing hardware to reach the masses was the TV Tuner card with capture functionality. On many TV Tuner cards, the capture is software driven. So, even if the software bundled with the card does not allow you to capture the video, other tools should be able to do so. Then there are capture cards, which interface to various video input sources. For example, these take TV or VCR signals as input, which means you can record your favourite shows on television or convert your old tapes to digital format. TV Tuner and capture cards can only convert an incoming video stream and cannot be used to shoot a live video.

One of the best options for amateurs is the Web cam—they are very affordable and have multiple applications such as video and still capture, videoconferencing and some can even be set up as surveillance systems. Web cams do have some drawbacks, though. They generally do not grab good quality images. Also, the entire processing of the video happens on the computer, not the camera, hence, if the system is slow, the video quality is further affected. Again, a Web cam is useful only for live video capture.

A powerful machine with a fast processor, loads of RAM and gigabytes of hard disk space will yield a much smoother movie authoring process, but even a Pentium 200 system with 128 MB of RAM will do. What you compromise on the power of the system, you have to make up for with patience.

For software, you can use the proprietary software bundled with the hardware, or freeware such as VirtualDub. Pinnacle Studio 7 (***www.pinnaclesys.com***) provides a complete capturing and editing suite. It is especially useful for professional effects and is yet simple enough for anyone to use. It can take input from several sources and output it to a CD or even DVD. Similarly, for audio capture and editing you can use software bundled with the soundcard, or tools like SoundForge (***www.sonicfoundry.com***) or Cool Edit Pro (***www.syntrillium.com***). These are all very easy to use, unlike some of the more professional software.

As a rule of thumb, unless you're making video on the spot, have a script ready before you begin shooting. Knowing how you want the video to progress helps tremendously and you won't have any missing elements when you are editing the video clips.

Looking ahead

With the power of video on your desktop, you can wave your magic mouse and just let your imagination run wild. Convert your old marriage tapes into digital video, add captions to all the funny moments, burn them to VCDs or even DVDs, or impress your friends with your own version of *The Matrix*.

With broadband slowly encroaching upon us, soon you will be hosting your videos on the Web. The possibilities are endless. You may also be able to share a 'live telecast' of your son's birthday bash in India with his grandmother in the US. Or stream a conference from your head office in Delhi to regional offices across the world. TV channels should also start telecasting shows on the Internet. Initially they would only telecast select items like cricket matches, but one day they may choose to run the entire channel online.

The digital video scene is only going to get better. Expect far more powerful, cheaper products and much easier tools in the near future. Some motherboards already integrate capture capabilities onboard. Processors themselves are evolving at break-neck speed. Even with the products available today, you can capture at DVD resolutions. Encoding Dolby Digital sound on the desktop was not possible until very recently—it is now.

The tools of today allow professional quality multimedia authoring. The tools of tomorrow promise to be even better. This is not magic. This is reality.

VEER KOTHARI

For the Love of MIC

Unleash the budding musician in you—make your own music and play it to the online world!

There was a time when producing a high-quality recording of your own music would only be possible in a recording studio, under the expertise of a sound engineering wizard who could work all those intimidating sliders, buttons and knobs. However, today, technology makes it possible to build your own home recording studio, at a fraction of the cost of professional equipment.

If you've acquired a multimedia PC system in the last few years, you already have the core setup upon which you can build your recording studio. There's a multitude of software, from sequencers to samplers to drum machines, and even full-fledged effect generators, all capable of emulating hardware audio equipment with quality. Since all editing has moved to the digital realm, you can process sound, add effects, mix and edit dozens of times without any loss in quality.

Digital music isn't a new development; musicians have used computers ever since the band Kraftwerk made its brand of techno music using synthesizers way back in the 1970s. Today, in our own country, Indi-rock musicians such as Demonic Resurrection, Pin Drop Violence and Reptilian Death use the PC to record their music demos. So not only can you use your PC to produce crystal-clear recordings of your own music, but also to put your demos on CDs, distribute them online and make good money from the airplay!

Tools of the trade

The kind of recording setup you need depends on the kind of music you are interested in making, and the instruments (if any) you will be working with. As for the right platform, there isn't a huge difference between the Mac and the PC for audio applications and you could go with either one. While some experimental synthesis tools are tailored specifically for the Mac, today's PC is more than up to the task of meeting your audio recording needs.

Your PC-based recording studio can be as basic or as sophisticated as you wish, depending upon your budget and target application. The good news is that even a minimal PC recording setup can yield superior results than the analogue setup that used to be considered 'cutting edge' not too long ago. In your base computer, a 7,200-rpm ATA-100 drive is fast enough to handle the creation of WAV files that are critical to your audio recording process. Obviously, the larger the hard disk, the greater will be the number of recordings you can store on it. Lots of RAM (256 MB at least), and a fast CPU (over 1 GHz) will boost the performance and speed, especially during the editing stage. Sequencing software need to display a lot of information on screen, so a 17-inch monitor running at a high resolution (at least 1024x768 at 75 Hz) is desirable. A CD-Writer is a must-have and writeable CDs have become downright cheap—you can expect to pay less than Rs 20 a disk. Though this is not a required component when you start off, you'll soon want one to store and distribute your music demos.

For a basic recording setup, you would have to invest in a good soundcard such as the SoundBlaster Live! Value, a microphone and powered speakers, all of which will cost you between Rs 10,000 to 15,000 (*see box, 'Professional Hardware'*). Warren Mendonsa, the lead guitarist of Zero, uses an M-Audio Audiophile 2496 soundcard, M-Audio Audio Buddy mic preamp and a Shure SM58 microphone to record his guitar solos. You will also need an outboard mixer if you plan to work with multiple microphones, since the number of microphone inputs on conventional soundcards is limited to one.

The recording process

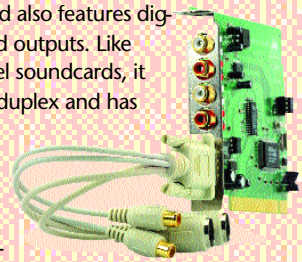
The actual process of recording depends upon the equipment and the type of music being recorded.

SoundForge 6.0, FruityLoops 3.5, WaveLab 3.03a, BBE Sonic Maximizer, Cakewalk SONAR 2.0 Demo, ReBirth RB-338 2.0.1, Reason 2.0

Find them in Software > Multimedia on the Mindware CD. Plus, sound clips in Surge > Samples on the Playware CD for you to experiment with

Professional Hardware

M-Audio Audiophile 2496 Soundcard: While the SoundBlaster series from Creative is heralded as a high-end soundcard series, its features and functions appeal mainly to the gamer. M-Audio is a professional audio company that has built a reputation among musicians looking for professional-grade digital audio. The Audiophile 2496 features full 24-bit and 96 KHz audio support, aimed at multi-track recording. The card is fitted with two analog inputs and outputs (one stereo pair each) and also features digital inputs and outputs. Like most pro-level soundcards, it supports full duplex and has multi-client support, which means that more than one program can access the soundcard simultaneously.



Shure SM58 Microphone: The Shure SM58 dynamic microphone is perfect for all kinds of vocal applications, making it a favourite among vocalists and sound professionals. This mic boasts of excellent sound feedback and extended frequency response from 50 to 16,000 Hz. Its rugged construction with a hardened steel mesh makes it an investment that will last you for a long time.

ATI 8MX2 Mic Preamp/Mixer: If you plan on recording from more than one sound source at a time, you need a mixer which ensures that everything gets to the soundcard at a proper line level, while allowing you to leave multiple sources plugged in simultaneously. The 8MX2 is an impressive digital multi-track system that offers eight mic preamps and a stereo mix bus with good monitoring capabilities.

Studiophile Monitors: 'Monitors' is a term used for the speakers that let musicians hear what they play while they play it. You can have the best gear in the world and still have no idea how it's really going to sound unless you have monitors that let you listen to your tracks with faithful reproduction. With M-Audio's Studiophile line of studio monitors, even the gentlest nuances reache your ears. The most popular from this line are the SP-8B speakers with 8-inch woofer or the smaller, bookshelf-sized SP-5B with 5-inch woofer. Add the optional SP-8S subwoofer to either model and you have all the bass you would need during your recordings.

Here are some possible scenarios, depending on the kind of gear accessible and whether you want to record your music all at once or each instrument individually. If you have a sequencing software, you can individually record parts of the instrumental and vocal sections and arrange and edit them later. This is especially useful if you are just getting into audio recording and are not a 'one-take' musician.

Scenario 1: Spontaneous sounds This is the most rudimentary method of recording audio. Here, your band plays as if delivering a live performance and all the vocal mics, drum mics, guitars, bass, and other instruments are fed into a single soundboard from where you can control the volume and equalisations of each instrument. All these audio inputs are finally downmixed into a conventional stereo output which the soundcard records as a stereo file. You can control the levels of the musical instruments and vocals only during the recording and not afterwards.

Once you have a line level signal from the soundboard going into your soundcard, fire up the audio recording software, say SoundForge. At this point, you are basically using the computer as a simple digital tape recorder. You'll end up with a single stereo mix of the entire band, which is more or less a finished product. The only editing you can do is to equalise it, add basic effects such as Echo and Reverb or eliminate noise in the audio file. You can't re-record just the rhythm guitar or replace the bass with a piano. This type of setup is suited to recording just the vocal track of a song or in cases where you essentially want to only change the audio characteristics of the recording such as volume, equalisation and noise filtering. The advantage is that the cost of equipment is relatively lower than setting up a multi-channel recording station.

Accessories you need: A full duplex soundcard; a rudimentary soundboard or mixer (M-Audio Audiobuddy; Price: $160/approx Rs 8,000)

Scenario 2: Total control over individual tracks Here you record each instrument individually and do all the

Jargon Buster

Full duplex: The ability to simultaneously record and playback through the same audio hardware. Older soundcards (Half duplex) could either record or playback and were unsuitable for professional applications.

MIDI: An acronym for Musical Instrument Digital Interface, this format uses codes to define the type of sound a musical note plays. MIDI has no audio properties; it's just a set of instructions that are decoded by the audio hardware (soundcard, synthesizer, etc). Since actual sound data is not captured by this format, MIDI files are far smaller than WAV files.

Patch: A MIDI term that describes the type of musical instrument being played by the MIDI synthesizer such as a tuba or a bass horn or a snare drum.

Polyphony: A term for the number of simultaneous voices or instruments that a synthesizer can play.

Soundboard: Also known as a mixer, it combines a number of input sources, allowing you to add effects and equalisation before sending the total mix to one or more outputs.

WAV: This format stores digital audio by a process called sampling. Here, the audio signal is encoded by grabbing segments of it and encoding it in a time-based manner. For example, for CD quality audio, WAV files are captured at a frequency of 44.1 KHz in 16-bit samples.

Wavetable: A table of digitised samples of actual recorded sound that is stored in read-only memory (ROM) on a soundcard chip or in the main memory of a computer. This method is implemented in MIDI audio. Wavetable is much higher in fidelity and authenticity compared to FM synthesis.

mixing and production later. It requires a full duplex soundcard and software that allows multi-track audio recording such as Acid, Cakewalk Sonar or Cool Edit Pro. Once you have set up your gear, you should start by laying down a click track (a track with a simple rhythmic beat). Everyone records his or her individual part separately to the cue of the beat. The advantage of recording this way is that everything is on its own separate track, so you can alter the volume and equaliser settings and pan any individual part, or re-record it until you get it right, or even get rid of it altogether, without affecting any of the other recorded tracks. The downside is that it's harder for your band to groove together and throw in improvisational bits, but it does ensure that everybody stays on the rhythm.

Accessories you need: A full duplex soundcard and a mixer (the M-Audio Audiobuddy; Price: $160/approx Rs 8,000)

Warren Mendonsa
LEAD GUITARIST, ZERO

"Unless you have a professional soundcard with multiple inputs and outputs, and separate microphone presets or a mixer, you're better off recording track by track"

Scenario 3: The best of both worlds

This combines scenarios 1 and 2, and comes closest to how recordings are done in a professional studio. Each instrument can be recorded individually, or all together at one time. You'll need an ATI 8MX2 Mic Preamp/Mixer and a soundcard with multiple ins, such as the M-Audio 2496. The difference is that you are using an outboard mixer with separate outputs on each channel (instead of just a single stereo line out), which is hooked into a recording device with multiple ins. This means the whole band can play together, but everything gets recorded on its own track. You can derive the benefits of scenario 1 (live/spontaneous sound), as well as of scenario 2 (total control over each individual track). This kind of setup costs much more since the recording system needs to be multi-track all the way, but it provides you more flexibility to record that perfect song.

Accessories you need: A full duplex soundcard; a soundboard/ mixer with multiple ins (Mackie 1202-VLZ Pro; Price: $399/approx Rs 20,000, ATI Preamp Mixer; Price: $2,995/approx Rs 1,50,000, Shure SM58 Microphone; Price: $69/approx Rs 3,500)

Choosing the software

For purely techno or dance music, you can start off by using a fully featured multimedia PC loaded with a software synthesizer such as Reason or Rebirth, or a sampler such as eJay. No musical skills are required—all you need to do is play around with the sound samples and interface controls, and before you know it, you

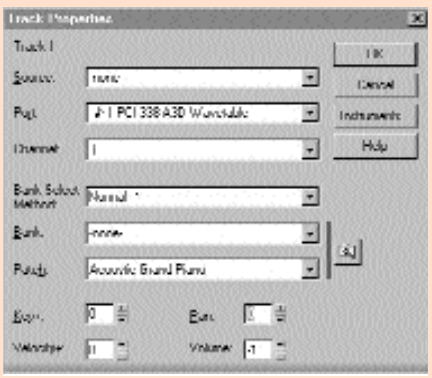
Recording with Cakewalk SONAR 2.0

Let's step through the process of setting up and recording your first track using Cakewalk SONAR 2.0.

STEP 1 Configuring Cakewalk SONAR 2.0: Start by setting up your MIDI ports (*see box 'Jargon Buster'*). Go to ***Options*** > ***MIDI Devices*** and choose the ports you want to use for your MIDI input and output. Here the MIDI input port is the port through which SONAR receives MIDI information if you have a musical keyboard. The MIDI output is the port to which the MIDI audio signal is directed. Choose the Wavetable port for output as this results in much higher fidelity MIDI sounds.

Configure the MIDI input and output ports

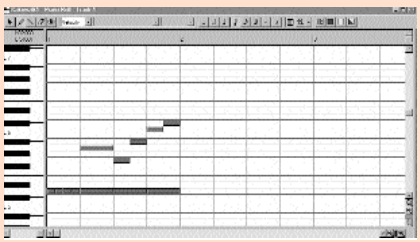
STEP 2 Preparing a track: Before you feed in the notes into a track, you need to set certain parameters to it. Right-click on the first track in the Track view and set the Channel number. As a rule, set it to the same number as the track you are working on. Then select the instrument you would like the track to play from the Patch drop-down box. You can choose from a wide variety of instruments such as the acoustic grand piano, violin, etc.



Choose the instrument from the Patch menu

STEP 3 Feeding in notes: If you are well-versed in musical notation, the Staff view is where you should feed in notes. If you have no formal training in music but posses a good ear, choose the Piano Roll view—you can click and create notes in this panel in the form of bars.

The most efficient way to feed notes is through a MIDI-capable musical keyboard. In the main Staff view, simply press the 'R' button on the track to which you want to feed in notes—this arms the track. Then click on the Record button on the bar and play away.



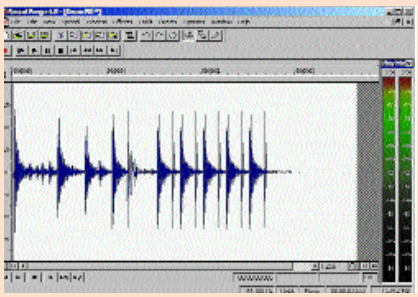
Feed in notes in Piano Roll view

STEP 4 Fine tuning: Finally, when it all comes together, you can configure the volume for each track, and add the chorus and the reverb effects through the Console view.

STEP 5 Playback: After you've created all your tracks, go back to the beginning of the song, and hit the Play button (or the [Spacebar]) and you have your first MIDI recording!

Editing with SoundForge 6.0

SoundForge can be used for editing, filtering, adding fade in and fade out effects, tweaking the frequency characteristics of the song, etc. We've used SoundForge 6.0 to illustrate the process of creating and working with a WAV file.

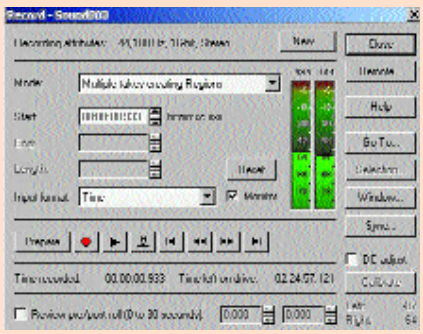


SoundForge: the Photoshop of audio editing

STEP 1 **Setting up SoundForge 6.0:** First, see if the recording attributes are set to 44,100 Hz, 16-bit, Stereo for CD-quality recordings. If not, click on the Record button in the toolbar. You could choose to record at higher frequencies and then downsample the final output. Choose the recording device in the Preferences menu. Next to Mode, select Automatic Retake (automatically rewind). Check the Monitor box so that you can monitor the sound input levels.

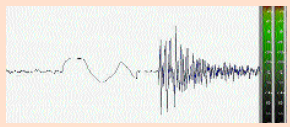
STEP 2 **Recording:** Click on Prepare in the Record window. When the word 'Prepared' starts flashing, click on the Record button. The file will start recording. Click on the Stop button when you've finished recording.

Note: If the word 'Clip' appears above either of the meters, it means that the recording level was set too high and you will need to start over and re-digitise the file.



Set the Recording frequency to 44,100 Hz

STEP 3 **Editing:** You can edit your audio track by using the Pencil tool. Here, you can 'carve' the response of your audio by simply drawing around the recorded wave file—play around with this and see the results. You can also use the noise gate from the Effects menu to filter out signals below the threshold you've defined. Voila! You've recorded your first WAV file! Now you can directly convert your track to an MP3 file or burn it onto an Audio CD.



'Draw' with the Pencil tool to edit the wave file

will be able to produce sounds and rhythms good enough to record!

You will also need a multi-track editing software that can record several tracks and mix different recordings together. Look out for the number of tracks you can edit simultaneously—entry-level programs limit you to eight tracks, which could cause you to lose interest rather quickly. Good editing software also support plugins and editing features. Most importantly, the layout of the software should be user-friendly. Cakewalk SONAR is one such software that is not only powerful, but also feature-packed and easy to navigate. There are plenty of other software you can choose from to record and sequence your music such as Cubase, Cool Edit Pro, Vegas, Nuendo and SoundForge.

> "I use either Nuendo, Cool Edit or N-track for recording; Fruity-Loops is good for drum and keyboard programming"

Sahil
FRONTMAN, DEMONIC RESSURECTION

Distributing your music

Creating your music is only half the job. A lot depends on how well you make your sound heard. Marketing music usually involves marketing professionals, music companies and lots of funds. That leaves most of us searching for alternative means to spread the music. Techno savvy bands are increasingly using the Internet as a means of worldwide promotion of their talent. The best avenue for all artists is ***MP3.com***, which has a Pay-for-Play program that can earn you some money if you get a good number of hits.

Take the example of Demonic Resurrection, an extreme metal band known only in small circles in India. With the help of the Internet, the band has reached out to a considerably wider audience than they would have through conventional methods. They have been nominated for the best extreme metal act at ***MP3.com*** and are now being signed on by record labels from Brazil, Malaysia and Indonesia. "The Net has helped people across the world hear us. We have the maximum downloads compared to any Indian rock and metal act. We've received some 8,000 plus hits on ***MP3.com*** alone and some 2,000 downloads on Audiogalaxy," says Sahil alias Demonstealer, founder of Demonic Resurrection.

Midival Punditz, an ambient fusion group with Asian Underground roots, use their official site and ***MP3.com*** to popularise their music. Even classical musicians like Chandrakant Sardeshmukh and Veena Sahasrabuddhe have garnered a huge fan following at ***MP3.com*** with 75,000 and 1,40,000 plays respectively. Bands like Parikrama have had over 500,000 views on their homepage, and provide their MP3s free for download. Encode your music in MP3 format and let it be swapped around in the file sharing programs. Once viral marketing takes over and the popularity of your songs increases, the sky is the limit!

With all the ingredients for cooking the tastiest of digital audio tracks at your disposal, today it is easier than ever to create, fine-tune and distribute your opus—right from your home. "Technology has empowered the musician, helped him refine his skills, but it cannot make you a better musician," says Rohit, the bassist of Pin Drop Violence. "Well, it can hide your flaws to some extent, but the basic thing is if you don't know how to cook, the best utensils won't make the food tastier."

Need we say more?

SRIRAM SHARMA

HOTSHOTS

Share your pictures, send photo greeting cards and even get T-shirts and ancillary merchandise with your picture on it—all through online photo album services

Tired of hauling out all those heavy albums each time you want to walk down memory lane? Sick of obliging all your relatives by ordering mass reprints of wedding snaps? Then maybe it's time you posted your pictures online. Online albums make it easier for you to share your pictures with friends and family, and you can use the Internet to do it for free. And confess it—don't many of you have old pictures that sit in dusty photo albums for years on end or even in the plastic envelopes they came in, without you casting a second glance at them?

"It never occurred to me to use a photo gallery, until my brother had a baby and we wanted to send pictures out to friends and relatives all over the world," says Reshma, who has a nine-album photo gallery at ***photos.yahoo.com***. "Besides, after I received a few death threats because of the bloated attachments I used to send," she adds, "I decided it would be safer to host them online!" Having an online photo album has the implicit advantage of not clogging other people's mailboxes with bloated photos—since they're in a central repository on the Internet, they can be accessed from anywhere by any person with the right access.

Go digital

If you have a digital camera, it becomes easier to create an online album. The idea of spending a small fortune on a digital camera, when there exist an abundance of cheap disposable cameras, might seem a bit odd, but digital cameras are getting cheaper and easier to use and there are savings to be made with them in the long term. The problem with an old fashioned camera is that film costs money. And there's always the worry of wasting a shot, or ending up with a bunch of boring pictures when you finally see the developed photos a few days later.

Digital cameras are matching up to

their conventional counterparts in terms of imaging capabilities and ease of use, and the day isn't far when all photography will be completely digital. Digital photography has fewer limitations: you can take loads of pictures without the fear of running out of film or getting stuck with a dud. And you get to check the quality of your picture instantly—whether it is worth keeping or whether you'd be better off deleting it and shooting again. And the photographs can be uploaded and distributed on the Net within minutes.

Alternatively, you could also invest in a flatbed scanner. Available today in a variety of price ranges and features, they are the cheapest way to digitise your existing photographs. But there's always the cost of printing your photographs first, which makes it a solution only if you plan to work with a small number. If you regularly scan every print that comes back from the developers, you should seriously think about getting a digital camera.

Vanity fair

If you have your own Web space, you can post your digital images online for other people to view and also experiment with Web design. You can register a domain and rent some server space or use a free hosting site such as ***Yahoo!***, ***Geocities*** and ***Tripod***. Get a Web site authoring tool like Frontpage or VisualSite 3.0 (***www.futuretrendsoft.com***). Frontpage 2002 even offers a cool 'Photo gallery creation' feature that can make an online photo album for you. "I picked up some source code from ***gallery.sourceforge.net*** to create my own photo gallery. It was pretty easy to set up, and there are no restrictions against linking my images to ***www.hotornot.com*** or at forums," says Sacs, who created his own photo gallery containing 400 odd photographs.

The best way to present pictures online, especially if there are lots of them, is to make thumbnails—small copies of the larger images—that people can use as an index. This saves on bandwidth and lets viewers choose the images. They can browse through the thumbnails and view actual sizes of only the pictures they want to see. Building a thumbnail index is not very difficult if you have some knowledge of HTML and software packages such as Web Thumbnailer (***www.freedownloadscenter.com***) make it easier for you.

An online album lets you upload as many photos as you like. You can categorise them by creating albums for every vacation you take, each birthday party or special event. While most online sites offer storage space that would satisfy even the most trigger-happy shutterbug, some make additional storage space available for a small fee.

Choosing the right showcase

The intent of most photo album sites is to allow consumers to upload pictures, invite friends to view them, or send photo greeting cards, while they try and sell you ancillary merchandise and services. Most sites offer storage, uploading, and photo-sharing tools as their basic services but they vary in terms of the premium services offered as well as the price. Which one suits you best depends on how you use your virtual gallery.

The quality of service that you can get out of these sites is completely dependent on which side of the world you live in. While you can use any of the services provided in the table '*Photo Finish*', to upload and view images, ordering prints can prove to be an entirely different proposition. Most online album sites have no base in India, and you would have to tolerate delays with the post office and international mail for getting your prints. These would be irrelevant to your relatives in the US, though. The only Photo album site with a photo lab based in India is ***www.photojagat.com***. They have an alliance with Speedpost and DTDC, which ensures quick delivery of photos to virtually any part of the country.

DotPhoto: If you are a heavy digital camera user who sends greeting cards and pictures to friends and family on a regular basis, this site is for you. It offers several subscription plans, which will reduce printing costs. Join ***dotphoto.com*** for a $60 bulk photo account (approx Rs 3,000) and you get 372 photos. At $1.99 (approx Rs 100) per order, shipping is cheap. This is the only site where you can add sound clips to your digital photos. If you would like to sell prints of your photos, DotPhoto lets you specify royalty rates, so it's a site for professional photographers too.
www.dotphoto.com

Kodak Picture Center: This site is more focused towards developing prints rather than viewing them online. Loading images is

Creating your own Photo Gallery

Here's a step-by-step guide on creating an online photo gallery.

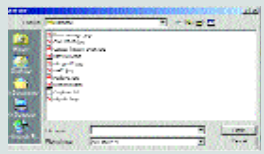
Step 1: Digitising your photos
If you have developed pictures, scan them in either GIF or JPG format. If you have a digital camera, use the bundled software to connect to your PC and transfer the images.

Step 2: Editing and resizing
You can upload the images either unedited, or after you've made changes using an image editing software. The resolution of the images depends on your needs—whether they are for Web viewing or printing. It's best to upload the largest file size that your Internet connection can afford; this gives your viewers the choice to obtain high quality prints.

Step 3: Registering with a photo album service
There are several sites to choose from *(refer table, 'Photo Finish')*. Find a service where you can display them free of cost—users of ***Yahoo!*** and ***Hotmail*** are entitled to a free online photo album.

Decide on a particular site to host your images depending on the total amount of space you want and whether you would like to avail of printing services.

Step 4: Uploading
Most sites have an easy upload procedure, similar to adding an attachment to your mail. Some provide desktop utilities, for others you have to use Web-based forms.



Step 5: Separating into albums
You can segregate your pictures in different categories pertaining to an event, like you would do in a proper album, instead of having all your images in one page.

Step 6: Inviting family and friends
Send invitations and links to friends and relatives in your address book and allow them to leave comments at your gallery. Most online album sites provide this service.

Online Photo Album Services at a Glance

Service	Storage Size	Photo Scanning Services	Direct Links to Albums	Cost Per Print	Pros and Cons	Overall Rating
DotPhoto	Unlimited	Yes	Yes	4x6 inch: $0.29 (~ Rs 14) 5x7 inch: $0.95 (~ Rs 47) 8x10 inch: $2.95 (~ Rs 147) 12x18 inch: $9.99 (~ Rs 500)	+ Order 30 free prints! Bulk prints are really cheap - Slow upload speeds, cumbersome navigation	★★★★☆
Kodak Picture Center	Free hosting for 200 photos for 6 months	Yes	Yes	4x6 inch: $0.24 (~ Rs 12) 5x7 inch: $0.89 (~ Rs 44) 8x10 inch: $2.59 (~ Rs 130)	+ Ties up with retail photo processing giants worldwide - Images are viewable only as thumbnails	★★★★☆
MSN Communities	30 MB	No	Yes	No Printing Facility	+ No registration required, ties with MSN services - No facility for printing photos	★★★☆☆
Ofoto	Unlimited	Yes	Yes	4x6 inch: $0.49 (~ Rs 24) 5x7 inch: $0.99 (~ Rs 50) 8x10 inch: $3.99 (~ Rs 200)	+ Easy to use and quick uploading - Expensive shipping rates	★★★★★
Photo Jagat	Unlimited	No	No	4x6 inch: $0.35 (~ Rs 17)	+ Provides printing services in India - A tad on the expensive side	★★★★☆
Shutterfly	NA	Yes	Yes	4x6 inch: $0.49 (~ Rs 24) 5x7 inch: $0.99 (~ Rs 50) 8x10 inch: $3.99 (~ Rs 200)	+ Easy to use, 15 free prints - Expensive shipping rates	★★★★★
Yahoo! Photos	30 MB	Yes	No	Prints developed at Shutterfly at the same price	+ Very convenient, easy to use and maintain - Outhouse processing, ordering prints is cumbersome	★★★★☆

cumbersome and only one can be uploaded at a time. The gallery interface only lets you see small samples of the image. This service ties up with many retail photo development giants around the world, which provide professional scanning and delivery services.
www.picturecenter.kodak.com

MSN Groups: Microsoft's community Web site, *MSN Groups*, allows you to start your own e-group where you can share up to 30 MB of images. This service is only oriented towards viewing and sharing your pictures, and ties up well with a host of other MSN services like the chat and e-mail clients.
www.communities.msn.com

Ofoto: This site has a drag-and-drop desktop software called Ofotonow that makes uploading photos extremely easy. It automatically transfers photos from your camera, allows for photo editing and lets you order prints through a single click. You can frame photos, create cards and more. Ofoto sends the prints to anywhere in the world through Federal Express shipments. The prices of the prints are reasonable, but the cost of shipping will pinch your wallet. They charge $0.98 (approx Rs 49) for two 4x6 photos and $4.99 (approx Rs 250) for shipping them! Payments can be made only by international credit cards such as Visa, Mastercard, American Express, etc.
www.ofoto.com

Photo Jagat: This site has all the required features and a helpful support and FAQ section. It recommends the best size for prints depending on the quality of your images. It has a client called PC Uploader that allows bulk uploading of images directly from your desktop. The main advantage with Photo Jagat is that it allows you to send prints within India using Speedpost and DTDC. It still requires an international credit card and at 35 cents a print (approx Rs 17), isn't the cheapest service around.
www.photojagat.com

Shutterfly: Shutterfly allows you to add, enhance, share and order prints online, and promises film-quality prints delivered to your doorstep. It also provides services for film processing from analogue cameras and uploading them online, and has features to create greeting cards from your photos. Shutterfly has a picture upload plugin that makes it easy to transfer pictures to your photo gallery from your desktop. The first 15 prints are provided free of cost, which means that you only have to pay for the shipping.
www.shutterfly.com

Yahoo! Photos: This is a totally free service provided by ***Yahoo!*** for all its users. All you need is a ***Yahoo!*** account and you're set. Uploading is manual and the site is fully functional in a no-frills kind of way. You can order prints, mugs, T-shirts and greeting cards customised with your photos, and the site ties in with other ***Yahoo!*** community services pretty well. It doesn't offer print processing, but redirects you to Shutterfly instead, where you can order prints. The main disadvantage here is that the site does not list India for photo print delivery.
http://photos.yahoo.com

Photo finish

Using an online photo album opens up your personal life to the entire world. Sharing your pictures for everyone to see on the World Wide Web just might turn into an open invitation for stalkers, spammers and the like. It's a better idea to create password-protected albums. Most photo album sites have an option for keeping the albums either public or password protected.

Although there is no dearth of Web sites offering free online photo albums, there is a wide variation in their reliability and the features offered. Some seem to offer you everything—full size images, nice thumbnails, good design, etc—and then they shut down, leaving you tearing your hair out: ***ecircles.com*** and ***zing.com*** were one of the first of such services but now no longer exist. Therefore, it would make sense to keep backups of your pictures on your PC and not rely on these services alone. Yet, with the functionality and universal appeal that these services provide, they are the best choice for shutterbugs who need a platform for displaying snapshots of their memories. So go ahead and use the Web as your photo gallery.

SRIRAM SHARMA

30 Minutes Expert

Recover deleted files

It's a habit that's hard to break. It seems so convenient, even secure, to permanently delete files. Surprisingly, most of us don't use the Recycle Bin's setting to permanently delete files. [Shift] + [Delete] is the vice. But moments later we realise that from the whole group, there was one file that is required. Or, a couple of days later, a client sends a mail saying that the project isn't complete and he'll need some files for cross-reference. Fortunately, there are ways to recover deleted files. All you need is the right tools. And a lot of luck.

Hard disk anatomy

A hard disk allows random data access, i.e. any file stored anywhere on it can be accessed at any time, as against a tape drive, where the tape would have to be wound to the particular location where the file is stored. Hard disks store data in sectors and clusters. The bytes of a file are allocated to each cluster, which are populated as required. Think of sectors and clusters as a hotel with floors and rooms where the files are guests. The guest list is stored at the reception and anyone behind the desk will be able to tell you which room a particular guest is in. Hard disks store information about each file in a similar way. The 'address' of each file is stored in a separate area of the hard disk that is not accessible with common tools. When a file is requested, the disk looks up this 'register', locates the file and passes it on. On FAT and FAT32 partitions, this entry is stored in the FAT (File Allocation Table).

When a file is permanently deleted, only its entry from the 'register' is removed. The actual file is still stored on the disk until some program requires space. Thus, it may still be possible to recover the file until another overwrites it.

Outlook Express Folders

If you have deleted a mail folder in Outlook Express, do not despair. Outlook Express stores folders as separate files. Look for files with your mailbox folder name and a DBX extension.

Stop!

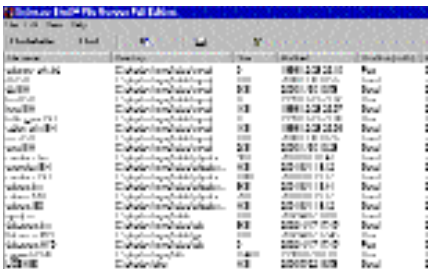
The moment you realise that you need to recover a deleted file, stop doing whatever you are doing on the PC. Do not close programs, shut down Windows, hit [Ctrl] + [S] or even chat, especially if you haven't defined a permanent swap file size in Windows. Any request for space, and the disk might just give up those precious clusters where the file may still be stored.

Plan out exactly how you want to go about recovering the file. Usually, there is no room for experimenting and, if any, there is only one chance. If the file is on a partition other than the Windows drive, you might have a much better chance of retrieving it.

Recover

It is advisable to have some recovery software already installed on the PC. Also make sure to install one on a drive other than the one running on Windows, as it may still write to the registry.

File Rescue: File Rescue (***www.softwareshelf.com)*** from Software Shelf is a small but useful tool for recovering files but the demo edition recovers only two files. It works with FAT, FAT32 and NTFS drives. When you launch File Rescue, it asks for the drives that are to be scanned and the kind of files to look for. Make your selections and click OK. It scans the disk quite fast and shows a list of files that it finds on the disk, but not in the FAT. It lists the file names, the folder from which



File Rescue displays a list of deleted files with details on their condition

File Rescue 2.7
Recover4all Professional
Find them in Software > System on the Mindware CD

they were deleted, their sizes, modification dates, prognosis and the file address on the disk.

The most important thing here is the prognosis. If it says 'Poor', then some parts of the file have been overwritten by other data and the file probably won't recover correctly. If the condition is 'Good', then in most cases, the file will be recovered completely.

Select the files you want to recover and click Undelete. When recovering the files, choose a drive other than the one you are recovering from—you don't want any data to be written to the drive until you finish recovering.

Recover4all: Another utility, Recover4all (***www.recover4all.com***) is available in two editions—both support FAT and FAT32, but the professional version also supports NTFS. Launch the program and select the drive you want to scan for deleted files. It

Recover4all displays the deleted file in an Explorer-like view

displays deleted files in an Explorer-like view, making it easier to navigate. This software also shows you the condition of the file and the possibility of recovering it correctly. Just select the files and click Recover.

Recovering files is simple and possible, but it doesn't always work. So the next time you use the [Shift] + [Delete] combination, be afraid. Be very afraid.

VEER KOTHARI

Disobedient desktops, feverish processors, dirty recycle bins and partitioning blues—we have a remedy for all of them

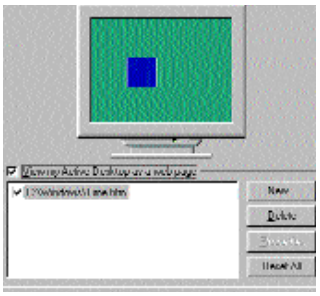
DNS on Linux

Q. I have problems resolving the names of Web sites on Linux. Thus, I am unable to browse the Net with Netscape unless I provide the actual IP address of the site, which can be found using ***nslookup***. The same version of Netscape in my previous installation of Linux worked fine. Why is it giving me trouble now?
Pradeep Shankar
Via e-mail

A The problem is not with Netscape. The DNS is not configured or isn't working correctly on your installation of Linux. To cure this you'll have to enter the IP addresses for the domain name servers into the /etc/resolv.conf file (one address is usually good enough, but it's better to add two). The file must have permissions as ***-rw-r—r—-*** and root ownership. You can get this information from your ISP. For example, if you are connected to a VSNL connection, the file after editing should look like this:
nameserver 202.54.4.24
nameserver 202.54.1.18
You should also check that your /etc/host.conf file is correctly set up for name resolution to look up the host's file before the DNS server. It should look like:
order hosts, bind
multi on
Once this is done, you should be able to surf the Internet with domain names.

Rude desktop

Q. My computer was running fine until recently, but now when I start it only a few icons are displayed on the desktop. These icons and Start menu do not respond to the left mouse button. Right-clicking results in the error message: 'Your current settings prohibit running ActiveX controls on this page. As a result, the page may not display correctly.' I am unable to work on the computer. Please help me.
Sanjay Dobhal
Via e-mail

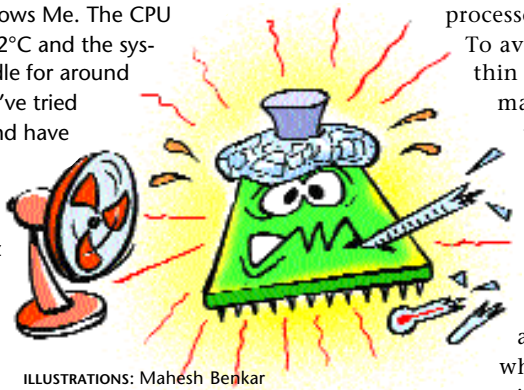


Turn off Active Desktop to disable Web content

A This might be a prank someone is playing on you. A static page could have been set as the desktop wallpaper, causing it to not respond. Use the key-combination [Win] + [E] to launch Windows Explorer. Open

Overheating Athlon

Q. I have a PC with an AMD Athlon 1.4 GHz processor, running on Windows Me. The CPU temperature often crosses 72°C and the system hangs. But if I leave it idle for around an hour, it works normally. I've tried keeping the cabinet open and have changed the jumper on the motherboard to 100 MHz FSB from 133. Now the processor runs at 1050 MHz and the maximum CPU temperature is around 64°C. However, I want the full speed of the processor. How can I use the processor at 1.4 GHz without overheating it?
Bhalasubramaniyan
Via e-mail



ILLUSTRATIONS: Mahesh Benkar

A Inadequate contact between the processor and the heat sink can cause the processor to overheat. To avoid this, apply a thin layer of thermal paste between the heat sink and processor. You should espect the average temperature of this processor to be around 55°C, which can go to a maximum of 60°C under heavy load. A larger, qood quality copper heatsink may also help.

Control Panel > *Desktop* and disable View my Active Desktop as a web page. This should solve the problem.

Sharp CMYK graphs

Q. I have a problem while creating pie, line and bar graphs for CMYK printing using PageMaker. I use Excel for preparing the charts, but it uses only RGB and the lines are jagged. I import this graph in CorelDRAW and edit it to smoothen out the lines and convert it to CMYK, which takes a lot of time. Illustrator does not have enough features for making graphs. In your magazine, you use charts and graphs with shadows. Please let me know what you use and the best procedure to draw a graph in CMYK for print processing.

Ramesh N.

Via e-mail

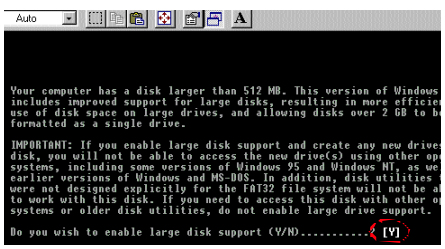
A We create charts and graphs in Macromedia Freehand. These are then imported to Photoshop where effects such as shadows and bevels are added. There's not much you can do about either of your problems with Excel, so working in Freehand and Corel is your next best option.

Partitioning blues

Q. I tried partitioning my hard disk using the partitioning software on the June 2002 CD. It is now showing two drives, one (C) of 16 GB and another (D) of 19.6 GB. Drive C uses a FAT file system and D uses FAT32. However, when I try to load any operating system on C, it gives a message that there is insufficient space. It gets installed correctly on D though. How do I correct this?

Anil Kumar

Via e-mail



Enable support for large disks in FDisk to create FAT32 partitions

A The drive does not seem to have been partitioned correctly—any partition over 2 GB cannot have a FAT file system. You have not mentioned what operating system you use; the process for fixing this will differ slightly across different versions of Windows. Boot to DOS and run FDISK. Hit [Y] when it asks you whether you want to enable support for large disks. You can delete the primary partition (C) and recreate it. If D has been created as a logical partition, you will have to delete this first. If you don't want to delete it and have Windows 98, try converting C to FAT32 using the FAT32 converter available with the OS. If you have Windows 2000 or later, you can simply use Disk Manager to do the job.

CMOS battery

Q. I want to know how to turn off the CMOS battery. If a user is not using the PC for a long time, does the battery get drained? Is there anything we can do about this? Will the removal of battery cause any adverse effect?

Santosh Ambekar

Via e-mail

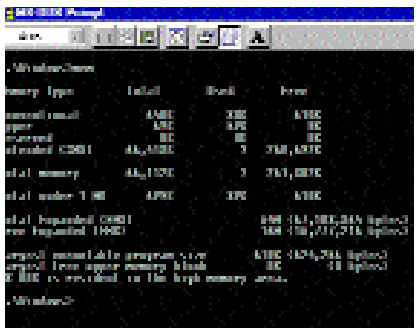
A The purpose of the CMOS battery is to retain the CMOS configuration while the PC is off. You don't really need to disable it unless you are planning to not use the PC for around a year. However, if you still want to do this, you can remove the battery from the motherboard. The next time you boot the PC, the CMOS will default to the factory settings and any configuration changes made to it will be lost.

DOS conventional memory

Q. I have a Cyrix processor with 32 MB RAM. When I try playing any DOS game on it, it says that the conventional memory is not sufficient. What will I have to do to run my games in DOS?

Ravi Kishore

Vishakhapatnam



Check the amount of free memory in DOS

A This is a very old problem with a crude workaround solution. While in DOS, type ***mem*** to check the amount of unused memory. Don't get boggled by the numbers—it might not show the amount of RAM on your PC accurately. You are interested only in the value of Free Conventional Memory. Open c:\config.sys for editing. Type the following lines at the top:

DEVICE=C:\WINDOWS\HIMEM.SYS /testmem:off
DEVICE=C:\WINDOWS\EMM386.EXE RAM
DOS=HIGH
DOS=UMB

Save the file and restart the PC in DOS. Check the amount of free memory, which should have increased substantially now. If the games still don't run, the soundcard or the mouse drivers are probably taking up some memory. Check if the game can run without either of these and unload the unnecessary one. If you need both, try preceding their load commands in the autoexec.bat with LH: ***LH C:\DRIVERS\MOUSE.COM*** This will load the drivers in the upper memory area and free up some more conventional memory for you to run your game.

Selective MP3 player

Q. I bought a Samsung MCD-SM60 portable MP3-CD player. It plays most of the CDs and MP3 CDs. However, when I try to play MP3 CDs created with Adaptec Easy CD Creator, the player recognises only some files out of the 100 or so on it. Do I need any special software for burning the CD?

Sumit

Via e-mail

A Since the player recognises some files and not others, it probably negates a lot of possible errors such as the media, burning errors and so on. This seems to be more of a file error. Check the bitrate at which the MP3s are encoded. Avoid using extremely high bitrates; 96 or 128 Kbps should be enough. Also avoid variable bitrates (VBR). If these fail, try burning the CD at a lower speed.

Compress video with DivX

Q. I have read a lot about DivX in the past couple of months in your magazine. Though I have visited numerous sites, I could not get an answer to my query. I want to convert my VCDs to DivX format to save space. How can I do that?

Amit

Via e-mail

A To convert video formats to DivX, you will have to use a software that can encode with this codec. You can use freeware such as VirtualDub

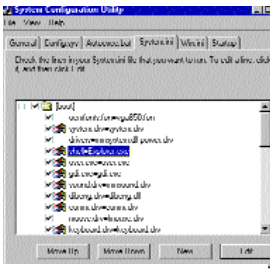
Plagued by a virus

Q. I use the Internet frequently and have McAfee anti-virus installed on my PC. I think my machine is infected with some virus. Whenever I connect to the Net, approximately 800 files of 78 KB with the .eml extension get created in each folder with a zero-byte attachment (ATT00004.txt). The Internet is shared by six other PCs and they all seem to be infected.

Vikram Bhatia

Via e-mail

A Your PCs seem to be infected by the Nimda virus. To remove it, update your anti-virus software from ***www.nai.com***. You can also find a McAfee anti-virus update on the Mindware CD under ***Software*** > ***Essentials***. If this does not help, you'll have to remove it manually. First, disconnect the machine from the network, disable all network shares and turn off all file sharing. Now delete all .eml and .nws files of 78 or 79 KB size, dated later than September 18, 2001. You can use Windows Find to locate all files with these extensions. Delete all instances of readme.exe and load.exe. If you are running Windows 2000 or XP, delete any instances of mmc.exe, admin.dll and riched20.dll dated September 18, 2001 or later, sized 58 or 59 KB. You may have to reinstall or repair Windows or Office after doing so.

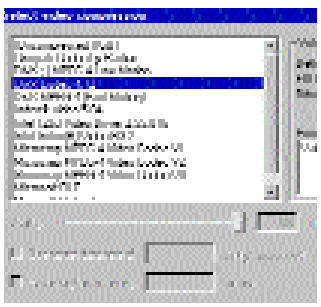


Use msconfig to edit your system.ini file

If you are running Windows 98, run msconfig and expand [boot] under the System.ini tab. You will find a line that reads ***shell=explorer.exe***. If there is anything else on the line, change it to ***shell=explorer.exe***.

After rebooting the machine you can restore the network and enable file sharing.

to encode files with the DivX codec. This software can take most video formats (including MPEG 1 and MPEG 1.2 DAT files) for input and any installed codec for encoding. (*For a step-by-step procedure, check the digital video workshop on page 96.*) For more information, check ***www.mydivx.com***.



Select the DivX codec in VirtualDub

New graphics card

Q. I have a PC with a Pentium III 600 MHz processor and 128 MB RAM at 133 MHz. I just installed a CD-RW drive and an nVidia graphics card. I set the CD-RW drive to master and the CD-ROM drive to slave on the same channel. When I restarted the computer, it showed me an error that read 'C:\>C:\ESSAUDIO–BLASTER Primary Codec Error'. I removed the CD-RW drive, but I still get the error. The CD-ROM drive is still kept as slave. I cannot play audio and video files. How do I solve the problem?

Deepak

Via e-mail

A The CD-RW and CD-ROM drives don't have anything to do with this problem. The graphics card is probably the culprit. However, it could just as easily be due to the soundcard's drivers. Your system seems to be loading the drivers in DOS, though this is not required. Open c:\autoexec.bat in Notepad and add ***REM*** before all the lines that refer to ESSAudio. For example, if the line reads ***C:\ESSAUDIO.COM***, change it to ***REM C:\ESSAUDIO.COM***. If the soundcard does not work in Windows, then you will have to download the latest version of its drivers and install them from ***http://www.esstech.com/techsupp/drivers.shtm***.

If the problem still persists, then the soundcard is probably conflicting with the graphics card. Try downloading the latest nVidia Detonator drivers for the graphics card from ***www.nvidia.com***. If this does not help either, change the soundcard slot if it is not an onboard card. You can also check the AGP aperture size set in the BIOS. Set it to twice the amount of RAM you have, i.e., 256 MB.

Dirty Recycle Bin

Q. On Windows 98, whenever I try to empty the Recycle Bin, I get the following message: 'The Recycle Bin format is invalid. Do you want to empty the Recycle Bin?' If I click Yes, the system hangs, and if I click on No, nothing happens. However, I can delete files from DOS. Please give me a solution.

Shyam

Via e-mail

A Windows 98 emulates a Recycle Bin from a folder named Recycled—one folder for every drive. One or all of these folders is probably corrupted on your system. Start the PC in DOS mode by holding down the [Ctrl] key while the PC is booting to bring up the Windows 98 Startup menu and choose Command Prompt Only. At the command prompt, type ***attrib -s -h recycled*** to remove the system and hidden attributes of the folder. Unless this is done, DOS will not allow you to delete the folder. Then type ***deltree /y recycled*** to delete the folder. Repeat this for every drive. Note that all items in the Recycle Bin will be deleted. Now, restart to Windows and run a thorough Scandisk on all drives to check for errors. The folders will be recreated by Windows as required.

Office XP SP1

Q. I have Windows 98 SE and Office XP installed on my PC. I recently tried to update Office XP with Service Pack 1 (SP1) from the February Digit CD. During installation, I got an error message that reads: 'Error 1328: Error applying patch to file. C:\Config.msi\PTA0A0.TMP. It has probably been updated by other means and can no longer be modified by this patch.' What can be wrong?

Nishant Sangar

Via e-mail

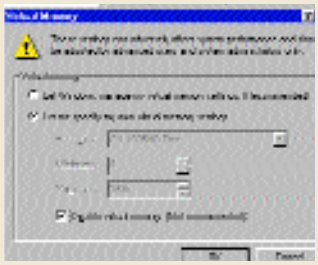
FAQs

Mysterious file

Q. I have a 15 GB hard disk. On my drive C, there is a file named win386.swp that takes 60 MB of space. I want to delete this file, but whenever I try deleting it, I get an error message. I even tried deleting it by starting the PC in DOS and in the Safe Mode. Although it gets deleted then, it reappears when Windows starts. Please tell me what to do.

Varun Kumar Arya
Via e-mail

A. This is the Windows swap file. Windows uses this file to temporarily hold data when it finds the RAM to be insufficient. With the kind of applications we run on our computers everyday, it would be virtually impossible for your PC to run smoothly without this. The file is always opened by Windows for reading and writing, thus you cannot delete it. Though you could disable virtual memory from ***Control Panel > System > Performance > Virtual Memory*** and remove the file, this is not recommended.



Turn off Virtual Memory in Windows 98

Hard disk not detected

Q. I have an ASUS P2B motherboard with a Pentium II 400 MHz processor and 128 MB RAM. I changed the hard disk to a Seagate 40 GB 7200 rpm. Now the BIOS does not recognise the hard disk, but it works well on other systems.

Please help me solve the problem.

Arul
Via e-mail

A. Your motherboard is quite old and you will have to update its BIOS for it to detect any hard disk upwards of 37 GB. You can download the BIOS update utility from ***ftp://ftp.asuscom.de/pub/ASUSCOM/BIOS/BIOS_FLASH_UTILS/aflash206.zip*** and the BIOS patch from ***ftp://ftp.asuscom.de/pub/ASUSCOM/BIOS/Slot_1/INTEL_Chipset/i440BX/P2B/with_Hardwaremonitor/1014__02.zip***. Remember to take a backup of the BIOS before updating it. (*For more instructions, refer to Digit, June 2002 issue.*)

CD-RW maintenance

Q. I recently purchased a Sony CD-Writer (24x-10x-40x) and want to know if the lens for reading and writing is the same. I am told that if I use the drive for reading, it shortens its life. Is this true?

Manish Katiyar
Via e-mail

A. Yes, the same lens is used for reading and writing on this drive. There is no need to worry though; this will not affect the expected life of your writer.

A. This is quite a common problem that occurs with an updated version of Windows Installer, the tool Microsoft introduced for software installation and maintenance. A complete uninstall and re-install of Office will help. One Microsoft article suggests that you may be using a beta or unlicensed version of Office XP that cannot be upgraded to SP1—you might need to purchase an authentic box packed version.

Web server setup

Q. I am a freelance software developer. My current project is a Web-based application using ASP/JSP. I plan to use Linux and MySQL in the near future and I expect approximately 10,000 transactions per day with 300 concurrent users. Is MySQL stable enough for this requirement? What can it scale to? Which is the best Linux flavour for this? Is ASP supported on Linux? What is the ideal hardware configuration for the server and clients?

Selvakumaran
Via e-mail

A. MySQL should hold up to your specifications, but whether it really does and what it scales to depends entirely on the database design, the number of tables, the number of fields, the types of queries, the joins used, etc. Without such information, any estimate on reliability would be vague. Debian is a very stable Linux distribution, but Red Hat is the most popular flavour for the Internet and also has more support. You can deploy ASP applications using the Apache, iPlanet or Zeus Web servers with Sun Chili!Soft ASP found at ***www.chilisoft.com***. However, there is no deployment solution for ASP better than IIS (Internet Information Server)—you may lose out on performance and even miss a few methods and functions while working with third-party tools such as these. You can use any standard server configuration; a 700 MHz processor with 256 MB RAM should work, though you should consider throwing in as much RAM as your budget will allow.

System File Checker

Q. My PC runs on Windows 98. Whenever I start System File Checker, I get the message: 'SFC cannot check the following folder because the volume is locked: c:\windows\system\macromed\shock7. Close all other programs and click Retry to check this folder again. Click Cancel to stop checking files.' How do I remedy this?

Rohit
Via e-mail

A. Close all programs before running SFC—press [Ctrl] + [Alt] + [Del] to bring up the task list. End all tasks except Explorer and Systray. If the error still shows, browse to the folder in the error message from Windows Explorer and check its properties. All attributes should be unchecked. If it's already so, reboot the machine and hold down the [Ctrl] key while booting. Choose Command Prompt Only from the Startup menu. Run a thorough scandisk on drive C and fix all errors.

If the problem still persists, move the Shock7 folder outside the Windows folder. You can re-install the latest version of Shockwave from ***www.macromedia.com***.

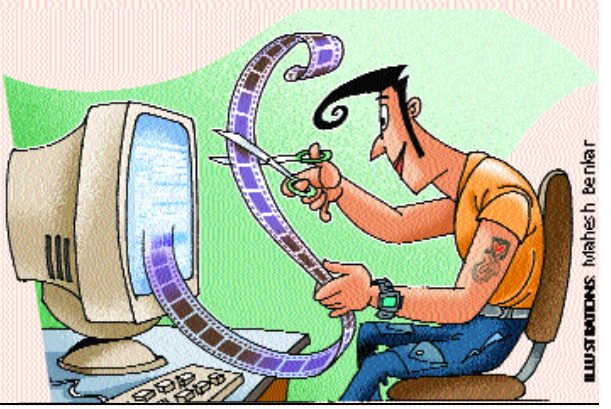
Send your problems to sos@jasubhai.com or write to Digit, D-222/2, Om Sagar, MIDC, Nerul-400 706

tips & tricks

Digital A/V Fundas

contents

Tips to adding that something special to the music and videos you've created

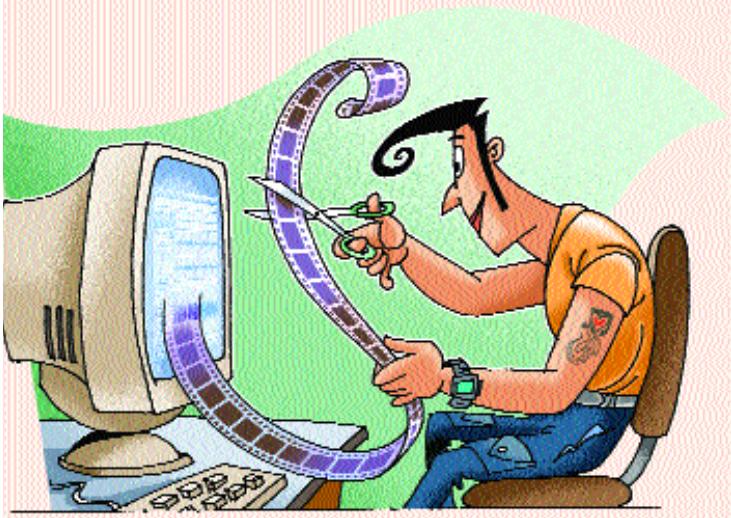


ILLUSTRATIONS: Mahesh Benkar

SoundForge 6.0, FruityLoops 3.5, Cakewalk SONAR 2.0, ReBirth 2.0.1, VirtualDub 1.4.10, DivX 5.02 codec
Find them in Software > Multimedia on the Mindware CD. Plus, sound and video clips on the Playware CD for you to experiment with.
Tips & Tricks: Power up your PC

VIDEO EDITING

Video authoring on your PC is very simple and there are some cool things you can do with the right tools. Here are some secrets to capture, edit and process video on your PC



Enhancing video quality

Picture and sound quality is what makes one video stand apart from another. Effects, animations and other gizmos will never make up for a hazy image or hissing sound. The video quality is most affected by the quality of capture. Here are a few things to look out for when creating videos

Resolution for quality

For maintaining the video quality, you can optimise the frame resolution and frame rate. Unless your system is good enough to support both at maximum, you will have to prioritise between the two. Most hobby videos are captured at 320x240, at 10, 15 or 30 fps. For editing though, it is better to capture it at as high a resolution as possible and scale it down later. If the resolution cannot be pushed up much, increase the frame rate if the capture is smooth.

Image levels

Use brightness and contrast settings to tweak the input video. Pick a scene with plenty of dark and bright areas and adjust the settings accordingly. Unless you use a well-calibrated monitor, do not rely on it to check the darkness; if black areas look grey, its brightness needs to be lowered, but monitors often show dark greys as black so use a software instead.

Avoid dropped frames

If the system is slow, it may not write some frames to the disk and dropped frames will occur. The result is a null frame that takes up virtually no space and simply mimics the last frame. More dropped frames result in a jerkier video and are more apparent at low frame rates. Dropped frames usually come in bursts, thus the video will have large jerks instead of slight jitters. If you are compressing the video in real-time, dropped frames occur when the data rate is the highest—when the most action occurs, which is the worst time for a jerky video.

To avoid dropped frames, you can try decreasing the frame rate or the video resolution. Also, optimise the hard disk and close all open applications while capturing. If you still don't get a smooth video, turn off preview while capturing if possible. You can also try reducing any real-time effects the capture software may be applying to the video. If you have a good processor but a slow hard disk, increase the compression quality so that smaller chunks of data are written to the disk.

Interlaced video

Interlacing increases the visible resolution of a video. A frame is split into two fields, which are sent back-to-back. Both fields interleave with each other to form a complete picture with twice the vertical resolution. Frame sizes with 288 lines or less of vertical resolution usually cause non-interlaced captures. The problem with interlaced capture is that the two fields don't have to correspond to the same frame. Instead of capturing 25 frames per second and encoding them into field pairs, cameras actually send alternating fields of 50 different pictures. Any standard video compressor used with this video, except for MPEG-2 and MJPEG, will mistake this interlacing for fine detail. As a result, other parts of the picture will suffer or the file will be larger than expected.

Keyframes

Many codecs compress video with keyframes. One frame (the keyframe) stores the entire image with the colour information of every pixel. For subsequent frames (delta frames), only the differences between those and the preceding frame are stored. To get to a frame, the decompressor will first get

information about the keyframe, then all subsequent frames to build the final image. More keyframes mean larger files, but lesser seek time. Also, frames further away from the keyframe are more susceptible to low quality, since each time only an approximate difference is stored. Thus, you should keep the keyframe interval to as low as possible.

Avoid outdated formats

Microsoft Video 1, Radius Cinepak, and Indeo 3.2 are all outdated formats. Video 1 cannot always render perfect frames, since it can assign only eight colours to every 16 pixels. Radius Cinepak drastically affects the picture quality with its motion prediction function and also creates very large files. Indeo 3.2 can cause colour bleeding and dithering. Though Indeo 5 is much better than Indeo 4, the latter is a good codec for AVI files if you plan to distribute the video to a wide audience; Indeo 5 cannot be decoded on a Macintosh. Also, avoid proprietary formats such as MJPEG, VCR1, VCR2, ASV1, and WNV1—codecs for these are not easy to find and are not free.

Recording sound

If your hardware allows it, plan beforehand whether you want to record sound along with the video itself or from an external source. An external source usually means much better quality, but can also prove to be sluggish and is a hassle.

Since one audio file is created for every video, you have to keep track of double the number of files in post-production. Also, synchronising audio and video involves more time and has to be done perfectly. However, if you capture video and audio simultaneously and the system is slow, it may be susceptible to dropping frames as it has to process the video and the audio at the same time.

Audio levels

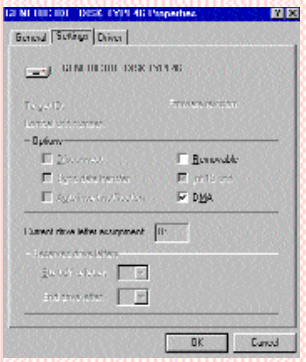
The capture volume should be high enough for clear sound. Softer is preferable over louder, as long as the sound is audible. 16-bit audio is better for capturing, since it has much more precision than 8-bit.

Editing with speed

Capturing and editing video is much better with loads of computing power and disk space, but even on the best machines, processing video is a very slow process. Here are a few things you can do to speed it up

Enable DMA for IDE

If you have Windows 98 or later, enable DMA for the hard disk. Open ***Control Panel*** > ***System*** > ***Device Manager*** and double-click each disk under Disk Drives. Check the DMA box under Settings and click OK. Older drives may not support DMA, so the next time you reboot, some of these boxes may be unchecked.



Enable DMA for your hard disk for faster access

Windows 98 or better

Windows 98 has a much more efficient disk subsystem than Windows 95, which allows better writing to the hard disk. This can significantly improve capture quality and editing speed. Windows 2000 is preferred over any other Windows version. Windows 95, 98 and Me will not allow AVI files over 2 GB. If you use Windows 2000 or XP, there is no such limitation, but do turn off some of the operating system's memory-hogging features if you use XP.

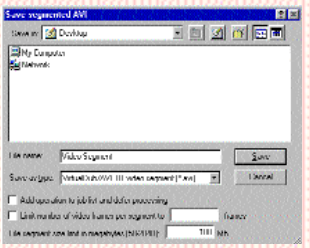
Use faster partitions

Files stored at the start of a disk are faster to access. Make sure that the video is captured to a partition which is at the start of the disk and which is not already too full.

Note that the position of the actual data matters, not the size or position of the partition. For a disk split in half, data at the end of the first partition (when the drive is nearly full) will be read at the same speed as data at the start of the second.

Sum of all parts

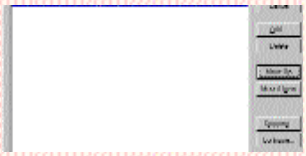
When editing a large video file, it may be a good idea to break the file into smaller bits. You will probably be applying filters and recompressing the video after editing. Once you finish cleaning up each bit, you can join them together again and recompress and apply the filters at the same time.



VirtualDub can automatically cut video into smaller parts

Mixing filters

If you are applying multiple effects to the video, arrange them in the best possible order if the software allows you to do so. Doing so can cut the conversion process by half or even more. For example, if you apply a filter to smoothen out the video and another one to resize it, place the resize filter first—the smoothening filter will have



VirtualDub lets you apply filters in any sequence

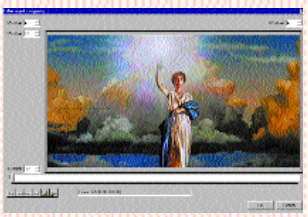
to work on a smaller image and also, you would want the smoothening to work on the resized image for best quality.

Cut video down to size

The size of the video file matters tremendously during post-production as well as for distribution. The larger the file, the longer it will take to process. Also, the video should be small enough to be burnt on a CD or DVD or even published to the Internet, depending on how you want to share it with your friends

Dead space

If the video has a solid border around it, cut it away. Though black bars compress extremely well and may even take no space at all, the sharp edge between the picture and black area takes a lot of space. Video compression



Cut out unnecessary bands from the video

algorithms are meant to optimise the smooth edges in video, not perfectly horizontal or vertical artificial breaks. Normally, compressors break the image into 8x8 or 16x16 blocks and the borders will not affect much if they conform to these boundaries. However, if they don't, the compressor will either use a lot of space for forming those perfect edges, or smear them.

Image ratio

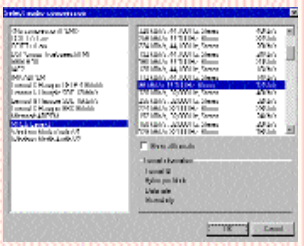
If you intend to compress the video with DivX, the final movie size should be in multiples of 16 pixels. Sometimes it can be in multiples of 8 and, very rarely, 32. Thus, a 320x240 video will compress well with DivX, but 321x240 will not.

Manageably large

When capturing video, pick a frame size close to the final output. If you're going to make a 320x240 video, it doesn't make much sense to capture at 640x480, since it takes four times the space to do so. Ordinarily, do not set the frame rate higher than 30 fps.

Compress audio

AVI files with CD-quality audio (176 Kbps) are quite a waste of space, especially for home videos. For distribution, 8-bit audio at 44 KHz is good enough. Also, compress the audio with a codec. This will reduce the size of the audio to between half and a quarter of its original size with very little loss in quality. MP3 is the best codec to encode audio. However, on slow machines it can cause synchronisation problems in the video.



Choose an audio compression codec in VirtualDub

Nix Intros and Trailers

Use computer-generated graphics sparingly with video. Video compressors are adapted to natural images and do not perform optimally on saturated colours and sharp edges. Depending on the codec, title screens and overlay items can adversely affect video quality, especially at low bitrates.

If you must include them, make openings and trailers independent—don't use transitions to blend them with the video and have them start and end on keyframe boundaries. Align the position and size of overlay items to 8x8 or 16x16 pixel boundaries and make them opaque. Transparent regions on the logo will be translated as a complex tile by the codec and will take up a lot of space. If the logo is opaque, the codec will ignore it between keyframes, saving a lot of overheads.

Don't pack video

There is no use compressing video files to ZIP, RAR, etc. Compression greater than 2 per cent means the video itself is not constructed correctly. You will need three times the space of the video to pack it and so will the person viewing the video. Also, viewing partial downloads becomes impossible. If the video is distributed as it is, depending on the codec, a partial download can be viewed or repaired.

DivX

DivX is the latest in video compression technology. It affords very high quality video in very small files using MPEG4 compression. This is the best codec to use, especially for distributing video. DivX 5, the latest version, uses variable bitrates (VBR)

Did You Know? Video@Home

The *Blair Witch Project* proved that great video is possible with low-end equipment. This movie was shot on Hi-8, a low level video format with a camera that had a one-colour chip instead of the usual three on professional equipment. Only a simple camera-mounted light was used.

and is especially efficient. It detects the best setting for the video, so even if you set a very high encoding bitrate, it will not go beyond what is required, giving you high quality and maintaining the file size optimally.

AUDIO EDITING

Covered here are some of the best software for digital audio creation and tips to help you get started and become more familiar with them

Cakewalk SONAR

This MIDI and digital audio software is used by professionals for producing CDs, soundtracks, live performances and Internet content. SONAR is the perfect avenue for enthusiasts to enter into the world of digital audio and MIDI-based recording

Templates

If you plan to use Cakewalk for your music projects, it makes sense to have a template ready to define your musical ensemble, say, a pop track or a jazz quartet or a particular studio configuration (MIDI instruments, audio outputs, and so on). Templates make it fast and easy to create and configure new projects.

To create a template, create a new file. Add tracks, select the track properties and the instruments you want in your template. Now adjust the parameters and click ***File*** > ***Save As*** and select Template from the Save as Type list. Enter a name and click Save.

Layouts

You can save the current workspace layout (menus, panels, palettes, etc) or load any saved layout and apply it to the current project. You might want to create a layout so you can easily arrange the items in a convenient size and position on the screen. This is also useful if you create different genres of music ranging from Jazz to Pop to Classical, where you would want different workspaces to be shown depending on what you are comfortable with.

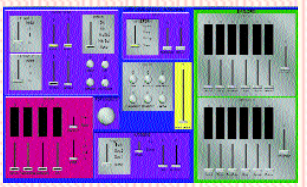
Shortcuts

Learn the basic shortcuts. The [Spacebar] starts and stops playback and the [W] key takes you to the start of the track. Use key bindings to associate commands with keys on your MIDI or computer keyboard. You can bind a key sequence like [Ctrl] + [M] to drop markers, or [Ctrl] + [A] to stop recording and return to the beginning of the song and so on. Select ***Options*** > ***Key Bindings*** to display the Key Bindings dialog box. You can even map out keys on your MIDI keyboard to act as triggers for events. For example, if you want [C] + [4] on your keyboard to activate your graphic EQ, you can map it as such using key binding in SONAR.

Studioware panels

One of the most useful features introduced in the recent versions of Cakewalk is the implementation of Studioware panels. Simply put, Studioware panels are onscreen representations of your outboard hardware such as FX units, mixers and so on. For example, if you have a Yamaha 03D, which is a 26-channel digital mixer, you can control its MIDI aspects onscreen through the use of a custom Studioware Panel that emulates its control panel. With a few simple mouse clicks you can control the device's faders, pan pots, effect sends and channel on/off functions through the graphic representation of its control panel.

There are always new panels available for download on the Cakewalk Web site. To open a new Studioware panel click ***File*** > ***Open*** and choose the file type as Studioware.



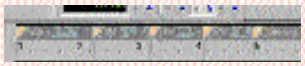
You can build your own front panels in SONAR

Undo and redo

Cakewalk supports up to 128 levels of Undo. Use the Undo and Redo functions in the Edit menu to step back and forth through recent edits. You can also jump directly to one of the previous 128 edits by selecting ***Edit*** > ***History*** and then selecting the edit point you'd like to return to.

Markers made easy

Add Markers in real-time during playback by pressing [F11]. Rename them afterwards by right-clicking on them. This dialogue also lets you adjust their position precisely by creating them at specified time locations.



SONAR markers divide your song into vocals, chorus, verse, etc

Using the Drum Grid pane

SONAR's Drum Grid pane makes editing drum tracks and patterns a snap. MIDI drum tracks usually sound unrealistic, unless you use timing and velocity information—SONAR makes it easy to edit these parameters in a single window. Use the Drum Grid Pane to add or delete notes, paint them in with the new Pattern Brush, and modify any note property.

To display tracks in the Drum Grid, create or load a drum map by selecting ***Options > Drum Map Manager***. If you want to create a totally new drum map, click the Create New Drum Map button in the Current Project field. Change the focus to the Track view. Select the tracks you want to view in the Drum Grid Editor and select ***View > Piano Roll***. The Piano Roll view appears with the selected track's data in the Drum Grid Editor. Use the Pattern Brush tool to produce a series of notes in the Drum Grid pane. The type of notes that appear in the Drum Grid depends on the settings you make in the Pattern Brush tool's dropdown menu. To open the Pattern Brush tool's dropdown menu, click the arrow on the tool's icon.

SoundForge

This is an excellent WAV file recording, editing and filtering tool. SoundForge lets you non-destructively cut and paste audio without any headaches and also allows you to add effects processing that was previously only possible with a large rack of expensive studio gear

Removing pops and hisses

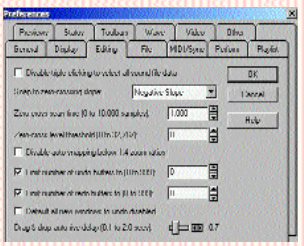
Sounds that you've put together don't always come out squeaky clean. Many times you'll have noticeable pops or hisses that weren't intended to be a part of the ensemble. This mostly occurs when the sound has been recorded at too high a level or if the input source audio is of low quality. To remedy this, you can either reduce the volume and re-record it at a correct level, or normalise the audio by bringing it to the correct level. Click ***Process > Normalize*** and specify a volume level (in per cent) lower than that of the original sample—it should be 80 per cent of the original sample. This will help get rid of any crackling and hissing present in the source file.

Speed up your SoundForge sessions

This tip works especially well if you're working with a very large audio file. There is a way to speed up the processing of SoundForge, but it's not useful in all situations because it involves disabling the Undo function. Be wary though; without the Undo function, there is no way for you to reverse any of the processing that you apply to your audio data. At the very least, you should make a backup copy of your original audio file before you attempt to do any editing.

To disable the Undo function click ***Options > Preferences*** to open the Preferences dialog box. Click on the Editing tab. Activate the Limit Number Of Undo Buffers To option and enter a value of 0. Click OK, and exit SoundForge.

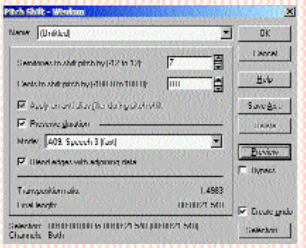
Now any processing you do in your files will be permanent, but it will be completed much faster. You can use the time you save to make even more music!



Set the number of Undo and Redo buffers to 0

The chipmunk effect

The chipmunk effect can be achieved by simply changing the vocal pitch to a higher frequency. The trick is in keeping the part the same length, because when you increase the pitch of audio, you normally shorten the length of the recording. Here's how to get around this problem: Select the audio data. Select ***Effects > Pitch > Shift***.



Create cool vocal effects with the Pitch Shift effect

Set the Semitones parameter to 7, and leave the Cents parameter at 0. Activate the Apply An Anti-Alias option. Activate the Preserve Duration option. Select Speech 3 in the Mode list. Click OK. Click on the Preview button to check out the changes before you apply them.

The Darth Vader effect

You can also use pitch changes to achieve the opposite of the chipmunk effect. Instead of the light and cheery sound, you can lower the pitch of your vocals to get

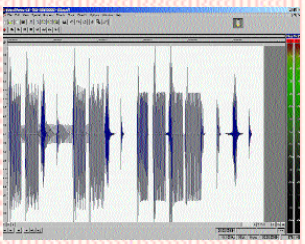
a very low and ominous vocal effect, like that of Darth Vader. Try doing this to a plain speech recording. Here's how: Select your recorded audio data. Select ***Effects*** > ***Pitch*** > ***Shift***. Set the Semitones parameter to -7, and leave the Cents parameter at 0. Activate the Preserve Duration option. Choose Speech 3 in the Mode drop-down list. Click OK.

To spice it up, try applying some reverb to achieve an 'evil laugh' effect. Select ***Effects*** > ***Reverb***, and then choose the Cathedral preset. Click OK. The effect should send a chill down your spine!

Fades, amplitude and envelope editing

In this tip, we explore many of the powerful tools that SoundForge provides. Load the 'ROB DOGG - A3.wav' file provided in the Surge section of the Playware CD into SoundForge. Adjust the zoom until your screen looks like the one shown here.

We can simulate the drums gradually fading in and out as if they are passing us by. Select the starting portion of the sound sample and then select the Fade option under the Process menu. A menu will pop up on the side showing three options: Graphic, In, and Out. Pick Fade In for now.



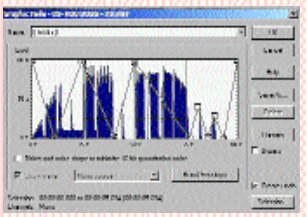
Fade in the first three seconds of the track

Selecting the Fade In option will automatically adjust the amplitude from the beginning to the end of the selection area you have marked in the sound sample. The computer will now process the sound sample and reduce the amplitude of the selection starting very low at the beginning and ending with no change.

Do the same to create a Fade Out starting about two-thirds of the way through the sound sample and continuing to the end of the sample. The Fade Out option is right under the Fade In option in the Process menu.

To change the amplitude of the entire song, select All from the Edit menu, and select the Volume option from the Process menu.

To achieve an envelope effect, where the sound fades in and out quickly, select the Fade option, and then select Fade Graphic from the popup menu. A large dialog box will appear with a graph representing the selection you made from the sound sample. There is a straight line across the top with handles on it. Click on a point (open square box) on the line and pull it down to shape the envelope. If you find that you need to add a point, click on the line and a new box will appear. Make your graph look like the one shown. When you are done, click on the OK button in the upper, right-hand corner to process the sound.



Use the envelope effect to make sound fade in and out quickly

Keyboard Shortcuts in SoundForge

Cursor movement	
[End]	The last sample visible in the waveform display
[Home]	The first sample visible in the waveform display
[Ctrl] + [End]	The last sample in the data window
[Ctrl] + [Home]	The first sample in the data window
Navigation and playback	
[Up Arrow]	Increases time magnification (zooms in closer to data)
[Down Arrow]	Decreases time magnification (zooms out farther from data)
[Shift] + [Up Arrow]	Increases level magnification
[Shift] + [Down Arrow]	Decreases level magnification
[Ctrl] + [Up Arrow]	Zooms selection if a selection exists, zooms fully if no selection
[Ctrl] + [Down Arrow]	Zooms to default zoom ratio set in Preferences

FruityLoops

As its name implies, this software is suited to creating loop-based electronic music from audio samples. Many people use FruityLoops for rhythm creation, since the layout is very similar to that of Roland drum machines

Knob adjustments

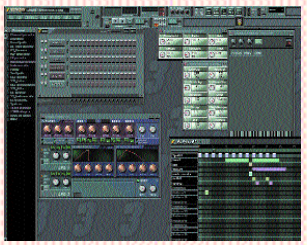
Use the [Ctrl] key to fine-tune your knob adjustments. If you think you messed up an adjustment, hold down the [Alt] key and click the knob to set it back to its default position.

Organising files

When you have completed a song, use the Collect Samples feature in the File menu to

copy all of the associated samples into one directory and save a copy of the *.flp file as well. That way you will be able to work on the song days, weeks, or even months later without having to relocate all of your samples. Backup your *.flp files often, so that you can track changes and modifications to subsequent versions of the file.

Enter useful information about the song (ideas for changes, etc) into the Song Info dialog box (found in the Options menu).



Add effects, twist sounds and layer the samples in FruityLoops

Synchronising loops

If you need to synchronise loops of different tempos, you'll have to stretch some of them. Divide the tempo of the one you're stretching by the target tempo to get the ratio by which you need to change the length of the loop.

Using multiple tracks

Another interesting thing you can do with multiple tracks is grabbing a couple of identical drum loops and triggering them at exactly the same point. Often, this will add a slight metallic quality to the sound and give it a bit more edge. Even better, try detuning one of the loops slightly; the bigger the detune, the more out of time the loops get. This will produce some interesting flanging effects.

ReBirth

ReBirth is an excellent software for emulation of drum and bass patterns. It is a software reincarnation of classic analogue hardware synthesizers. The panel looks like two Roland TB-303 bassline synthesizers and the Roland TR-808 and TR-909 rhythm machines

PCF: The heart of ReBirth

Pattern Controlled Filter (PCF) is basically a filter module consisting of 54 preset patterns, a two-pole filter and four control parameters. This is the unit that generates the basic sound loop upon which you can add effects and change various parameters that decide what the eventual loop sounds like. What this effectively means is that you have a little bag of tricks that can transform a dated synthesizer into a more sophisticated animal. Along with the PCF, the sound can be altered using the distortion and delay FX in ReBirth.

Here's how you can use the PCF filter to create your own track in ReBirth:

Step 1: To create a single note on one of the panels in pattern mode, click on one of the keys in this panel.

Step 2: Set the Tune knob on the 303 panel to the 12 o'clock position. For a rich bass sound set Cutoff to the 7 o'clock position, Resonance to the 4 o'clock position and Envelope Modulation to 3 o'clock. Decay should be set high so that the note characteristics don't fade too quickly. Play around with these settings for different effects.

Step 3: Press Play and listen to your one-bar bass note. Press the PCF button on the 303 panel. The green light will come on and you will notice a change in the sound. Lower the tempo so that you can hear the notes clearly.

Step 4: Flick through the various preset patterns by pressing the up and down keys next to the number on the PCF panel. With ReBirth playing, add some delay to your sound by turning the Delay knob on the 303 panel to 2 o'clock. You can edit the effect on the delay panel if you want.

Step 5: Audition some of the sweeping PCF patterns (12-17) and listen to how far your one-note ReBirth pattern has come. It's incredible what you can do with the synthesizer.

Step 6: Toggle to Song Mode and set a loop of eight bars beginning at bar 1. Choose Initialize Loop From Pattern Mode on the Edit menu. Make sure the loop is switched on and playing. You will now hear an eight-bar loop of the sound you created in Pattern Mode.

Step 7: By selecting the Record button and pressing Play, you can record the changes you make to the PCF parameters in real time into your track. Move the PCF sliders around to create your own filter patterns on top of the PCF presets.

Feel free to play around with all the knobs, now that you know the basics. You never know what you can come up with.

ILLUSTRATION: Ram

Get into the game!

Watch the boundries blur between what is real and what is virtual as games get more immersive

John was cornered. Chased down by the monster, he had taken desperate refuge in the wrecked boiler room, which was quickly filling up with steam. He had killed some of them, but this particular one had a very nasty habit of turning invisible.

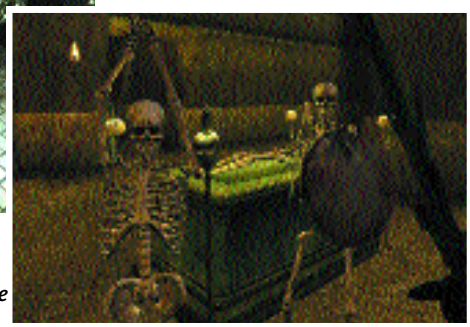
He had two bullets left. Sweat stung his eyes and his wounds throbbed with pain, but he dared not blink. Then, out of the corner of his eyes, he thought he saw the steam move. Not sure. And again, no doubt this time—a shot from his hip was answered by an unearthly scream. John grimaced. He knew he had got the creature, but only a bullet to the head would kill it for good. One bullet left. He waited. The steam swirled, the creature was stirring. Wait. Slow, deliberate steps brought the swirling white ever closer to John. Wait. The thing picked up pace, and the haze wrapped itself around the invisible form, granting it a grotesque shape and rendering it visible. Wait. The very air seemed to pounce, vapour danced and twisted to reveal jaws from hell. Wait. The figure was now inches away from John, he could smell its foul breath... BANG! Slowly, hesitantly, he opened his eyes to a sight of relief—a lifeless abomination lay at John's feet. He had lived to tell the tale.

Thanks to the advances in technology, the adventures of John are no longer confined to some twisted plot in a book, or some cheesy scene in a movie, but are brought kicking and screaming to digital life and on your computer screen.

Prettier than a picture

Every industry under the sky is in search of its Holy Grail, something that will define the zenith of achievement for that sector. For the gaming business the goal has always been providing an experience so life-like, that the line between real and virtual is not just blurred, but is completely erased. Immersion and interactivity have been greatly blessed by the continual evolution of hardware. CPUs are faster and sound has moved from the era of the PC speaker to the realm of six-channel Dolby Digital surround audio. The greatest change though has been in the video card industry. Heralded by nVidia, video cards are becoming increasingly programmable and thanks to the collective efforts of both the hardware and the developer segments, graphics standards such as DirectX and OpenGL are moving towards becoming higher-level languages, providing greater freedom and compatibility to game developers. These technological advances have brought the industry within striking distance of its goal.

Just how will this immersion be achieved? The first step is to pump up the basic building block of any game—the polygons. Greater the polygon count, the more detailed the world and everything in it. Polygon counts are no longer restricted to a few thousand, as the latest video cards are more than capable of handling a scene with 30 to 50 thousand polygons on the screen. Developers of *The Elder Scrolls III: Morrowind*, the third part in a series of role-playing games by Bethesda Softworks, have used this fact to create a highly detailed environment for the game. The on-screen characters are three-dimensional, created with high polygon counts and are clothed with multiple texture maps to make them look much more believable and life-like. A character can thus be shown in meticulous armour, and the armour can either have a realistic metallic shine, or a rusty worn-out look.



Greater immersion in games has been successfully achieved by upping the polygon count and adding lighting effects, as seen here in DOOM III (above) and Morrowind (right)

With better hardware, it is now possible to simulate smoke, dust storms and other particle effects

Moreover, weather changes such as fog,rain, dust-storms and day and night time cycles make the world of *Morrowind* much more believable and immersive.

Particle by particle

But *Morrowind* is just the herald of things to come. Particle effects are coming of age, adding realism to what was hitherto a very drab environment. Mark Rein, Vice-President of Epic Games Inc talks about the Unreal Engine: "A dynamic particle system is used to simulate dusty areas illuminated by light beaming through windows; and the dust moves around the air realistically as it gets disturbed by moving objects." Westka Interactive's *The Y Project* (a game combining action-adventure with role-playing elements, based in a science fiction/fantasy setting) uses this system to allow for impressive looking fires, sparks, smoke and foaming water. The particles are all tracked by the engine and since they react to objects passing through them, "when you fire a missile into a cloud of smoke, the smoke realistically dissipates", or if an invisible monster runs across a room filled with smoke, you will be able to see where it is by watching the smoke swirl as the creature moves through it.

Mark adds, "Another stunning effect is projective textures. They are used to create, among other things, soft-edge, ultra-detailed, real-time shadows, that cast on the world as well as the objects and characters within it. The intricate shadows not only render over the characters and the environments but also over the particles; as those particles are blown around by things flying through the air!" Immersive and interactive, isn't that what a game is all about?

In *The Y Project*, 30 per cent of the game occurs outdoors, where the particle system adds its magic touch. Clouds moving across the sky send real-time shadows creeping across the ground. The same system is used to create ripples and waves in water as you wade through it.

Regardless of the type of game, special effects are making a big difference in creating believable fantasies. A treat for F1 fans everywhere is Electronic Arts' *F1 2002*—realistic cars, accurately modelled real-world tracks, and anatomically correct models. These are just a few of the details that put you inside the world of F1 racing. The real treat though, is the simulation of weather, with rain batting down on your car, while raindrops settle on the windscreen and refract your view of the world, or the burned rubber that swirls from screeching tyres and dissipates languidly into the air.

But does creating a world in detail ensure immersion? Take a look around you and you will see the huge impact light has on our world. Even its absence adds a layer to realism. Just like the developers of the Unreal Engine, this truth hasn't escaped the guys behind *DOOM III*. For starters, all models will 'self-shadow', which is just programmer-speak for saying that parts of your body will cast shadows on other parts of your body. It doesn't sound like a lot, but it all adds up in the end. Secondly, models will cast shadows on other objects in their surrounding, so you might see a large shadow envelope everything in your sight before seeing the monster that is attached to it.

It's in the details

You must have experienced moments in a game when you knew something didn't feel right, but you could not be sure what. "Gee, isn't that guy I just shot supposed to fall down the stairs?" or maybe even "he sure looks funny with his pants on fire". You have been a victim of physicsitis. It is a disease that is transmitted to gamers when the game programmers have taken shortcuts to building their physics engine. Thanks largely to faster processors, game developers now have the power to go all the way with physics. People will fall down stairs realistically when shot and pants will look dandy when on fire!

Mark Rein, Epic Games, says, "Karma is a rigid-body physics engine that has been integrated into the Unreal Engine and [is] available to [appropriate] Unreal Engine licensees. It allows you to simulate solid objects such as crates, tires or bones, as well as different joints, motors or springs between objects. Using these simple building blocks, complicated systems can be easily built that will behave according to the laws of physics. This can be anything from the classic stack of crates, to swinging lights or doors that can be shot off their hinges, up to 18-wheeler trucks, or characters falling down stairs like a ragdoll when they die." So you can shoot at overhead lights, which will make them

War Games

Bohemia Interactive Studios' *Operation Flashpoint* seems to have attracted the attention of the US Army. The developers are building a 'Military Grade Program' based on *Operation Flashpoint* technology called VBS1 (Virtual Battlefield System 1). The system will initially be used to train US marines, and has attracted other military organisations across the world for the purpose of training their troops.

While the VBS1 system is top-secret stuff, another project in the works is public domain. *America's Army: Operations* and its companion game, *America's Army: Soldiers*, are both being developed by the US Army in the hope of persuading the youth to join the forces. Using the latest Unreal Engine, *AA: Operations* will be an online shooter along the lines of *Counter-Strike*, while, *AA: Soldiers* will be more of a shooter-cum-RPG experience, charting your progress through the army.

Putting the latest Unreal Engine through its paces is the US Army with its upcoming games America's Army: Operations and America's Army: Soldiers

swing and the swinging light will cast realistic, moving shadows all over the place. It all comes together to form a more immersive picture...

...Which brings us back to *DOOM III*, where realistic physics is part of the package—you can interact with everything in-game, knock boxes over and break stuff. And the same kind of interactivity extends to the bad guys as well. As John Carmack puts it in an MSNBC.COM interview: "That's one of the things that will give this game fear. If you were backed up to a certain kind of wall in the old games, you knew that nothing was going to happen because the wall was obviously part of the environment. That level of security is not going to be there [with *Doom III*] because the entire world can change and you will not be in command of your environment." So monsters can break through walls, glass windows and even doors to come and get you. Where you gonna hide? Why behind the barrel of my gun, of course! Since a bullet is also simulated by the physics engine, it will have a specific effect based on where you hit an enemy—if you shoot him in the shoulder, he will start spinning or turning backwards or if you decide to aim at his legs, he'll flip over.

But the game that has everyone jumping in joy is the racing phenomenon, *Gran Turismo 3* for Sony's Playstation 2 console. Not only does it feature cars and tracks that look like their real world counterparts, but it handles the physics side so well that race car drivers have been known to use the game to improve their racing skills!

Doing it with intelligence

Physics, pretty graphics and cool lighting effects are all well and good, but when you see an in-game character walk right into a wall or unrealistically overtake you in his inferior car, you are immediately reminded that you are inside the make believe world of games. Well, AI (Artificial Intelligence), as it is called, is perhaps the biggest misnomer in the gaming industry. Things might seem impressive when the soldier that you are shooting at ducks behind a crate and lobs a grenade at you, or as you are crawling through a pipe someone opens the hatch door and drops in an explosive, but when the same sequence is repeated time and again, you know that this isn't some advanced programming magic but some basic (albeit, clever) scripting.

Current technology has allowed developers to offload graphics processing to the video cards, allowing for better simulation of physics in games such as IL-2: Sturmovik (right) and Halo (above)

Lionhead Studio's *Black and White* made an honest attempt to rectify the situation. Casting you as a God in an unspoiled Eden, you could control one of several creatures that would observe everything you did, learn, remember and eventually form a personality closely mirroring your actions. Lionhead and its affiliate studios plan to take the technology further in games such as *Project Ego* and *Dimitri*.

Another title to watch is Elixir Studio's *Republic: The Revolution*. Revolutionary AI techniques will allow 'live' citizens to inhabit the dozens of towns and cities in the in-game country of Novistrana. Each person will have detailed daily routines that range from going to work, to collecting their kids from school, shopping and voting in an election. Each individual will also have their own set of beliefs, emotions, skills and loyalties that govern behaviour, producing consistent and realistic reactions to situations that arise in the game.

Are we there yet?

A while back, nVidia demonstrated the power of its then-latest baby (the GeForce 3 video card) by rendering the computer generated movie *Final Fantasy: The Spirits Within*, in real-time. "Time has come", they said, "the power to deliver a movie-quality game is here." Apparently, developers were listening. At E3, held in Los Angeles in May 2002, a recurring question that was asked at the*DOOM III* booth was: "Why are you rendering this [*DOOM III*]?", only to be answered by, "We're not rendering it... that's the game."

A few years ago, a director used UnrealEd (then shipping with *Unreal Tournament*) to generate 3D versions of the sets for his movie, granting him the ability to preview camera moves by flying through a real-time version of the virtual set. This gave him a pretty good idea of what the set was going to look like before physically building it for the actual shoot. The director was Steven Spielberg, working on the epic *A.I. (Artificial Intelligence)*. That was then. The tools are better now, so is the technology and the hardware driving it. Maybe next time Spielberg will not need the real sets.

AHMED SHAIKH

Unreal Engine as an Architectural Tool

A major challenge faced by architects is that of presenting their creations to prospective clients. More often than not, 2D sketches are insufficient for communicating the architects' vision, and they have to rely on physical modelling tools or CAD walkthroughs. Both these methods are time-consuming and do not offer ease of modification. Modern 3D game engines have come to the rescue, the fore-runner being Epic Games' Unreal Engine. The engine offers a great tool to developers of gaming and non-gaming products alike in the form of a mouse-driven level editor—UnrealEd. Architects use the tool to create a high polygonal version of their design, apply photo-realistic textures, and use the generated content to present a real-time

3D walkthrough to their clients. Given the networking capabilities of the engine, the client can be on the other side of the country. And modifications can also happen in real-time, since the tool is just a front-end for the game engine, which concurrently updates changes.

Hack-n-slash monster-stomping goodness!

Blizzard's new sequel revisits the war-torn world of Azeroth a generation after the end of the second war between the Orcs and the Humans. The fragile peace that had settled over the land is on the verge of being shattered at the hands of a dark power. Two new races, the Undead and the Night Elves have been added to the game and players follow a single storyline through four successive campaigns. This time around, the game plays in 3D, features online multiplayer support and provides design tools to make your own maps.

Going over the races...

Every race in *Warcraft III* has its own strength and weakness—to know which tactic will be most effective against your opponent's race can prove extremely useful. Each race has a large number of possible strategies, but there are only a couple of them that are the best in a given situation.

Humans: The Human alliance is a conglomeration of Humans, Elves and Dwarves. They have the most versatile army in *Warcraft III*, with very good ground and air troops, excellent siege capability and powerful spellcasters.

The Undead: The Undead have some good higher-level units, like Necromancers, Abominations and Meat Wagons. The Undead Scourge is a well-balanced faction that fields persistent ground forces and powerful air units. Their Spellcasters possess a variety of powerful magic, including the dreaded ability to raise fallen allies and foes alike into an army of the walking dead.

Use the [Tab] button to select and manage sub-groups within your horde

Orcs: These green-skinned dudes can do a good job, especially if mixed with long-range attacks from Head Hunters. Orcs can work wonders with strategies involving bloodlust. The Orcish horde has modest air troops and ranged attack capabilities, but their true strength lies in their brute force and raw melee power.

Night Elves: The last stage in the single player campaign, the Night Elves are a mighty race that emphasise mobility, ranged firepower and spellcraft. They don't have the brute strength of other races, but their skills with the bow and magic more than compensate for this deficiency.

SRIRAM SHARMA

Cheats Galore

While playing the game, press [Enter], type the code below, and press [Enter] again.

iseedeadpeople: Removes Fog of War (so you can see the map)
thereisnospoon: Unlimited mana
allyourbasearebelongtous: Instant victory
whosyourdaddy: Invincible units
somebodysetupusthebomb: Instant defeat (for you)
greedisgood: 500 extra gold and wood
warpten: Fast build
locainePowder: Fast death
keysersoze [amount]: Gold (i.e. 'keysersoze 50000' will give you 50,000 gold). The default is 500

Micromanagement Basics

Focus Fire

Focus Fire is arguably the easiest and most powerful aspect of micromanagement in *Warcraft III*. The concept is simple—all of your units attack just one enemy unit at a time. Instead, if you attack your enemies in general (Blind Fire), you will take a lot of extra damage. A perfect Focus Fire vs Blind Fire enjoys a 4 to 1 effectiveness ratio, making a huge difference.

Expand

Expand your base to a wide breadth across the map. Every time you see a gold mine, take it and secure it with towers—these are a must. As long as you have a strike force to take out the enemy's siege, the towers will shoot arrows at the enemies, giving good long-range defence. Thus, the more towers you have, the better.

Unit obstruction

Unit obstruction is the process of using your units as a shield to prevent your opponent from moving ahead. Using your units as a shield is pretty easy—just keep your melee units in front of your ranged units, or in front of a chokepoint or a narrow path.

Behind enemy lines

Send peasants early in the game to build guard towers right outside the enemy base. This is an annoying tactic for the enemy because he can't get out of the base without getting severely hit.

WARCRAFT III

It's finally out and it's worth the wait

One of the most anticipated games, from one of the most revered game development units, is the epic *Warcraft III*. Developer Blizzard has crafted this game with amazing production values, boasting totally rendered 3D graphics, a new game system and four playable races.

Warcraft III reminds one a little of *Diablo* with its role playing elements like quests, experience points and character development. The campaigns are well laid out—you'll progress from controlling the Humans, to the Undead, to the Orcs and finally the Night Elves as you save the world from the hands of the Burning Legion. The single player missions have a lot of variety in them, with hack-n-slash gameplay, to search and rescue missions.

The game cashes in on its production values. All the races are unique in the way their function and personality is stylised. The story is pushed forward through cutscenes; both rendered and in-game, and a compelling storyline that keeps you up till the wee hours. The voice acting and soundtrack is top-notch too, and lend well to the pace of the game.

The game wins over its fan base with the multiplayer option—players can connect to *Battle.net* and play against others from across the globe, or just have a LAN skirmish. You can even record the multiplayer game and view it later, a feature that is going to make for some crazy RTS strategies and counter strategies. Another winning feature is the world editor, which allows you to make your own maps and in-game cut scenes.

At Rs 1,499, it's a little expensive, though each pack comes with a poster, an extensive manual and mini books. *Warcraft III* is a finely tuned game with loads of polish and presentation, something you simply cannot afford to miss.

***ACTION!** In-game cinematics and cutscenes such as these will keep you hooked to Warcraft III*

Genre: Real Time Strategy ■ **Developer:** Blizzard ■ **Distributor:** Worldwide CD Roms ■ **Phone:** 022-6973994/95
Web site: www.blizzard.com/warIII ■ **Price:** Rs 1,499 ■ ★★★★☆

BHAGAT SINGH THE GAME

Inquilab [Ctrl] + [Alt] + [Del]

The package says 'For the Hardcore Indian'. If being a patriot includes the ability to stand tedious gameplay, poor graphics, bad AI, bugs, boring level design, and an intrinsically flawed weapons and health system, then this game is really hardcore!

The storyline is based on incidents from Bhagat Singh's life, such as his assassination of General Saunders. It's a first-time effort and the inexperience shows in every aspect of the game. Playing the game is a dizzying ordeal. The keyboard settings are un-configurable—the strafe keys are on one side of the keyboard and the direction keys on another.

***GOT A MATCH?** Poor lighting makes this game an exercise in tedium*

The gameplay moves at one-third the speed of a normal FPS and is compounded with bad voice acting, poor lighting and level design that leaves you fumbling in the dark, guided by a voice that says "Bhagat, *main* Durgadevi *bol rahi hoon, upar aa jaoo.*" Enemy AI is non-existent; the enemies just stand and shoot at you aimlessly, while mouthing catchphrases. The health system consists of killing white enemies and walking over them. We'd say that all the love for your country wouldn't make you complete this game.

Genre: First Person Shooter ■ **Developer:** Mitashi Edutainment ■ **Distributor:** Mitashi Edutainment ■ **Phone:** 022-5006661
Price: Rs 395 ■ ★☆☆☆☆

NEVERWINTER NIGHTS

Role-playing was never this fun

With a development cycle that's been longer than four years, *Neverwinter Nights (NWN)* was planned as a major milestone in the role-playing genre of computer games. The final product comes very close to delivering its promise.

MEET NEW PEOPLE...THEN CRUSH THEM: *The game pits you against beasties of all kinds and make*

Based on the third edition of *Dungeons and Dragons* rule-set, *NWN* comes packaged in three CDs, complete with a cloth map for reference and a hefty 218 page manual. With over 22 pre-made characters running the gamut from Halfling monks, to Elven wizards and swashbuckling rogues, the game packs enough personalities to suit your fancy and to get you up and running with just a few clicks. *NWN* uses the brand-spanking-new Aurora engine to immerse you into an interactive 3D world. The idiosyncrasies of camera-control and the RPG concepts of inventory management and leveling up are succinctly explained via a useful tutorial, masquerading as the prologue to an epic story.

The animations are top-notch—your character will swing, block, parry and duck enemy attacks, adding an amazing layer of realism and immersion. Lighting effects bring day and night cycles and real shadows. All these ingredients are brought together in locations ranging from foggy hilltops, to water-filled caverns that are swamped with monsters big and small, with attitudes to match.

The game tells a winding story that takes you on a voyage across cities and towns, both in and out of this world. You can pair up with one computer-controlled character that the game terms as a henchman. Moreover, you can summon and command creatures and if your created character allows for it, choose a familiar (a character) to be part of your adventuring party. Fans of previous BioWare games such as *Baldurs' Gate I* and *II* might be disappointed with the limited number of party members, or by the reduced level of interaction amongst them. Other pitfalls include some minor hiccups with path finding and other AI routines, and some not-so-minor ones that involve your game crashing to the desktop. Patches are coming in fast and hopefully these problems will soon be resolved.

The visuals are very well supported by excellent sound effects that include cries of pain and taunts to incite your enemies. The music rendered by industry veteran Jeremy Soule provides an excellent bridge between hectic battles and the tending to wounds that follow. Add to this the ability to play co-operatively with friends over a LAN, or on the Net and the fact that you can create your own adventures, it becomes obvious that the game offers an excellent package to play with.

Although not without its flaws, it does not take too long to appreciate *NWN* for what it is—an excellent role-playing experience.

Genre: Role Playing ■ **Developer:** BioWare ■ **Distributor:** Milestone Interactive ■ **Phone:** 022-8381614
Web site: www.bioware.com ■ **Price:** NA ■ ★★★★½

ALFRED HITCHCOCK: THE FINAL CUT

Cut it out!

Alfred Hitchcock's *Psycho* may have sent a chill down your spine but *The Final Cut* leaves a lot to be desired. You enter the plot as Joseph Shamley, a private detective hired by a young and beautiful mute, Alicia, niece of the pharmaceutical tycoon Robert Marvin Jordan. You have to uncover the mysterious overnight disappearance of your client's uncle and his entire film crew while shooting a Hitchcock film.

HELLO DUMMY: *Joseph gets his first shooting lesson while filming a scene*

Aside from a seemingly unrealistic plot, the game also suffers from irritating shifts in camera angles as you move around. Surprisingly, as you get into the first chapter of the game, there is a vast environment to explore, but moving your character around is a pain, as you can only do so using the arrow keys.

The environments are well designed and look quite appealing, although the same cannot be said for the character models, and Joseph's conversations with other characters are mostly monosyllabic and rigid. The game does have its moments though, such as the part where you're exploring the family burial ground which is accompanied by some eerie music. All in all, what you would really need to enjoy this game, is a whole lot of patience.

Genre: Adventure ■ **Developer:** Arxel Tribe ■ **Distributor:** Alladin Multimedia ■ **Phone:** 022-7895085/7903959
Web site: www.arxel.com ■ **Price:** Rs 999 ■ ★★☆☆☆

Circle of Life

Of dark nights, eerie sounds, high nerves, pizzas and ice creams

It was a dark, stormy night. Lightening rattled the window panes while the slashing rain washed the pale-faced building that stood as the solitary spectator of a sulking moor. Within the edifice lurked creatures with deep circles under their eyes and an eerie chant of "Issue closing, final proofs, comparison table validation..." hung like thick smoke in the air.

Issue Closing—two words that we have learned to associate with pandemonium and loss of hair. We come to work and buzz like busy bees at our monitors and keyboards all day. But the late night sessions, which are an omen of the approaching closing date, bring out the dark side that hides within us all. Nerves are high-strung; energy levels are low and the well-hidden quirks of every Digster surfaces from behind their mask of calm demeanour.

Take the case of Veer, a writer here at Digit. An otherwise unassuming individual, he is transformed into a sleep shunning, headphone-happy bundle of nerves come issue closing. But that is not the problem that had us up-in-arms that night in July. Breaking the monotone and grabbing the attention of the otherwise keyboard-happy 'Technology Journalists' (as we like to call ourselves), was a singular and eerie whistling. We had been working endlessly through the night and were decidedly feeling edgy. So it was not without reason that Sveta, our features editor was startled. The eerie whistling was then followed by an awkward wail. An investigation revealed that the source of the ruckus was not a table fan that had been on too long, but Veer's rendition of a violin segment from a classical piece of music. Suffice to say, his performance ended abruptly as a million paper balls headed his way. Veer's dodging skills have thus improved, though it is his singing that needs help.

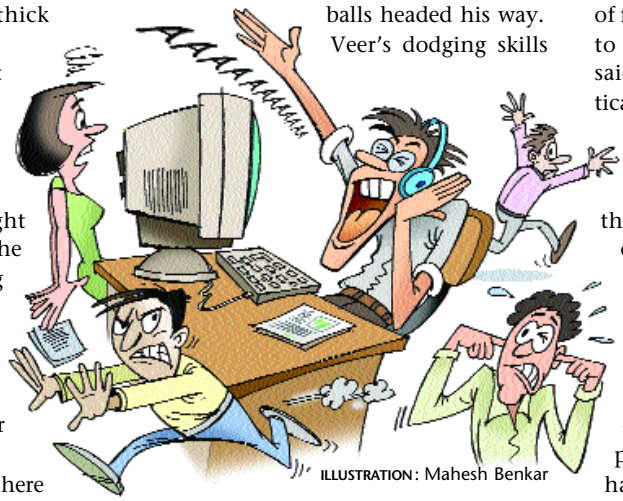


ILLUSTRATION: Mahesh Benkar

Even as we successfully quelled Veer, a shout of "we need it now", was heard from the Test Centre. Deadlines not only put people on the edge, but have also been known to demand sacrifices—the latest victim was Yatish. He is a Test Centre reviewer and perhaps the biggest fan of Tux, the Linux penguin. His hard disk was immediately required for the purpose of running a test—the very same hard disk that housed his beloved Linux. He was not pleased and as misty tears clouded his vision we caught a whisper of "I'll never forget you, my dear," as he hit the format button.

Troubles at the Test Centre were not restricted to Yatish though. Hatim, our deputy head of the Test Centre, was the latest to take part in the not-so-fun game of find-the-missing-editor. "So I just have to verify these numbers? No problem," said Hatim. Our editor however was frantically trying to close the August issue and was busy with other tasks. Hatim went back and forth between his desk and the editor's and before long, the night sky found him still awaiting a clearance. Frustrated beyond belief, he decided to boot up *Quake III Arena* for a quick frag session and promptly fell asleep holding the keyboard and the mouse. Things ended well as he got the required all-okay from the big-chief at an unearthly hour. The only problem was that it was so late that he had to crash at a friend's place and boy was he grouchy the next day!

Unearthly hours are regular guests here at Digit. Working non-stop through the weekends though, brings in the inevitable demand for nourishment. But that doesn't mean that we have to leave our chairs, heaven forbid! We have devised other solutions. Certain team members are diplomatically manipulated to stay back in case we need them for "some last minute references and cross checks". Incidentally, they happen to have vehicles at their service and are gullible to whines. Our taste buds are consulted, the weather is taken into consideration and a general discussion on what each person feels like eating ensues. So it's pizzas for lunch, then frankies at tea, *biryani* for dinner interspersed with hot *vada pavs* to drive away the chill and ice cream to beat the heat. And once the food-athon is over, we start thinking about what next to eat, until the grim reaper of deadlines (our editor) taps us demandingly on the head and we ignore our grumbling stomach till the next issue closing.

The circle completes itself.

The Light Side Conquers All

This month saw a special treat for Club Digit members. Subscribers were invited to a special screening of *Star Wars Episode II: Attack of the Clones*. The event was held in six cities and gave us the unique opportunity to interact with our beloved readers. In Mumbai the venue was the Russian Cultural Centre and we had a blast! *Star Wars* fans from all walks of life thronged together and, as one of our writers put it, "had a jolly good time". Although almost everyone missed identifying Ayesha Dharkar, the new Queen of Naboo, the highlight of the movie was the cool battle sequence involving everybody's favourite Jedi Master—Yoda. As he leapt into action, light-saber in hand, the entire venue erupted in excitement. There was much whistling and clapping and we were amazed as our seemingly gentle technology readers revealed their lighter side.

Yeh Dil Maange More!

It looks like the fan following for the much anticipated *Unreal Tournament 2003* is getting younger and more demanding! Wouldn't be a good idea to keep these guys waiting!

Is that a mouse in your monitor?

Talk about introducing your pets to computing—this hamster looks absolutely at home in this palatial 17-inch monitor!

10 Error messages we're likely to see in the next Windows

1. Smash forehead on keyboard to continue.
2. Enter any 11-digit prime number to continue.
3. Press any key to continue or any other key to quit.
4. Press any key except... no, No, NO, NOT THAT ONE!
5. Press Ctrl-Alt-Del now for IQ test.
6. This will end your Windows session. Do you want to play another game?
7. Windows message: "Error saving file! Format drive now? (Y/Y)"
8. File not found. Should I fake it? (Y/N)
9. Bad or missing mouse. Spank the cat? (Y/N)
10. Your hard drive has been scanned and all stolen software titles have been deleted. The police are on the way.

The software developers' drinking song

99 little bugs in the code,
99 bugs in the code.
Fix one bug, compile it again,
101 little bugs in the code.
101 bugs in the code...

Hounding the weak

So that's what it felt like when that trainee first joined the company's 6 o'clock *Quake III Arena* fragging session!

Your chance to bite back!

Highlight the lighter side of computing. Mail your contributions to: Backbyte Digit, Plot D-222/2, TTC Industrial Area, MIDC, Shirvane, Nerul, Navi Mumbai 400 706 or e-mail us at backbyte@jasubhai.com