

CD-ROM AND MULTIMEDIA* MULTIMEDIA TECHNOLOGIES AND DIGITAL APPLI- CATIONS

By Ching-chih Chen

Abstract: The author gives an overview on the CD-ROM technology area with text, picture, sound, and moving image all available in digital form.

Since the introduction of HyperCardTM, each year has been considered as one of the most significant years for the development of multimedia technologies. There have been so many significant advances related to various components of multimedia technologies - computer processing, image processing, optical storage technologies (including CD-ROM, analog videodisc, WORM, and erasable), display technologies, digital audio, consumer electronics, telecommunications, scanning, digitized video technologies, desk-top video technology, etc. All have contributed greatly to the development of multimedia applications.

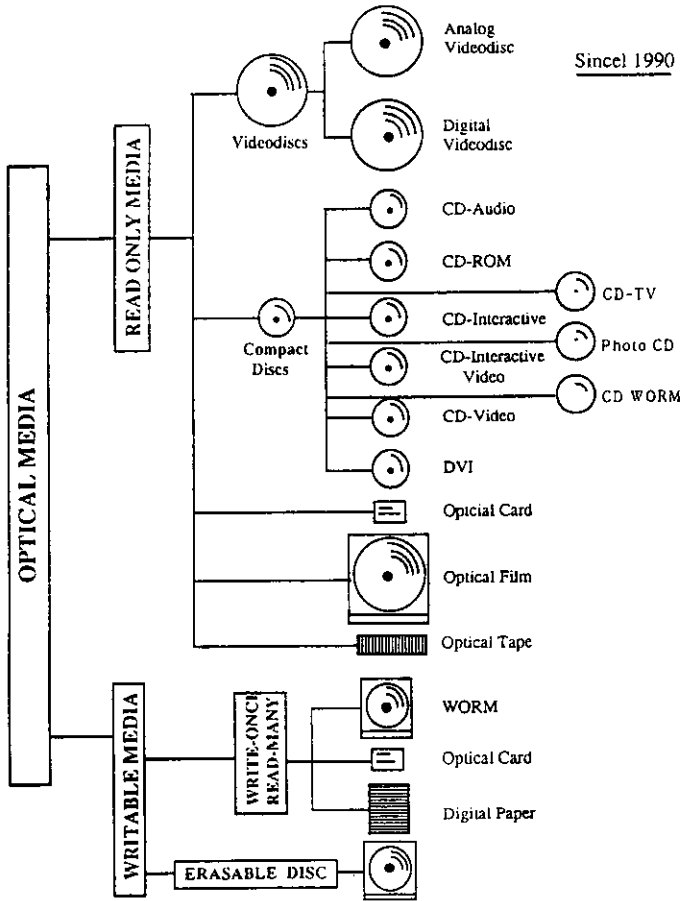
For example, in the optical technology area, there are so many different types of media (Figure 1). They include:

- CD-ROM
- CD-ROM XA (eXtended Architecture)
- CD-I (Compact Disc-Interactive)
- DVI (Digital Video Interactive)
- CD-TV
- Photo CD
- CD-WORM
- Videodisc
- Erasable

While all of them share some common features, such as large storage capacity, quick random access, portability, durability, etc..., they differ from each other as well in functionalities. When integrated with computerized information systems, they can be powerful tools to provide incredibly powerful solutions to information problems. Time does not permit discussion of each of the optical media. Brief

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Figure 1: Types of Optical Media



mention to a few of them serves to illustrate the great potential of these technologies.

CD-ROM

In the CD-ROM technology area, the rate of increase in both the number of drives installed and the number of CD-ROM products available continue to grow steadily and fast. The market platform for CD-ROM with an installed base of only 171,000 drives in 1988, has already reached more than 2 million drives now. Many early obstacles to acceptance of CD-ROM technology, such as price, performance of drives, ability to daisy-chain the drives, etc..., have been lifted. Furthermore, the capability to do one's own desk-top CD-ROM publishing is in place, thanks to the powerful but low-cost software and peripherals below the price tag of \$ 1,000, and the low reproductive cost, at \$ 500 for the production of a 600-MB master discs with 10 copies, and each additional for only \$ 1.50. Two students of mine were able to produce a CD-ROM with full-text access to over 2,000 pages of text and over 200 digital images in two months.

CD-ROM Jukebox

Now, high-end CD-ROM jukebox is also available to provide large networked full-image database access. Take the commercially available UMI's ProQuest MultiAccess System as an example, the CD-ROM jukebox is a significant component of an integrated information system. While the jukebox occupies less than 2 square feet of table space, it hold 240 discs with 600-MB of storage capacity for each of the discs. The 240 discs have the capacity to include 1.44 million full-page images. Up to sever such jukeboxes can be daisy-chained together to be connected to a system network, which can then deliver full-text and full-image document delivery over the network to system users in a few seconds.

CD-ROM XA, CDI, DVI, Photo CD WORM, etc...

One step of pushing CD-ROM technology to areas of multimedia is the introduction of CD-ROM Extended Architecture (CD-ROM XA) by Microsoft and Sony in 1989. This standard enables the inclusion of FM video on a standard CD-ROM. More advances also continue with DVI (Digital Video Interactive), CD-ROM XA (etextended Architecture), CD-I (Compact Disc-Interactive), Photo CD, etc... While some are more for meeting wide-scale consumers' needs. such as CD-I and Photo CD products, others are more geared for industrial and academic use, such as DVI.

CD-I

Compact Disc Interactive (CD-I) is a new consumer multimedia product invented by Philips of the Netherlands and introduced in 1986. CD-I allows audio, video, and graphic materials to be stored simultaneously on the familiar CD format. The CD-I system is capable of handling a large amount of interrelated data in real time. The result is a combination of synchronized audio, video, and text information. The total disc capacity of CD-I is shared between the various types of interrelated audio or video data. A wide range of interactive effects and video images are available, including full motion, full screen video, scrolling and partial updates. For audios, it is possible to store 16 languages on a same disc, although from practical point of view, it is not commonly done.

DVI

Digital Video Interactive (DVI) technology combines interactivity and high-quality graphics with the presentation of full-color motion digital video, stills, and audio; all in an IBM compatible personal computer. Since Intel shipped its first Pro750™ ADP Application Development Platform in mid 1989, it has been much easier for application developers to create interactive applications with full-screen/full-motion video, multiple-track audio, still video images, and dynamic graphics. Thus, broad and multimedia applications in a variety of markets, particularly in the industrial sector, have been introduced.

Photo CD

Building on audio CD technology, the Kodak Photo Cd system transfers images captured on exposed and processed 35 mm film onto a writable CD in the process as shown in Figure 2. A dual-purpose photo/audio CD player reads the information, and then displays a photographic appliances, the family TV. Once a roll of exposed film, or a given number of slides and photos have been processed, there are numerous possibilities. Since the images are digitally stored, the digital prints will give finishers the ability to crop and retouch with great ease. Digital imaging also makes it possible to produce easily various products, such as personalized postcards, business cards via desktop PC. Figure 2 is the cover of a Photo-CD of *The First Emperor of China*, produced under my supervision.

CD-WORM

In the electronic publishing area, aside from the use of CD-ROM as ideal publishing medium as seen from the proliferation of CD-ROM products (over 4000 titles in the current market place) and desktop CD-ROM publishing, it is now possible for us to not only having ROM products in compact discs, but also write on CDs once with the CD-WORM disc by using the CD WORM technology recently introduced in 1991. For the first time, it is possible for us to write about 600 MBs

of information on a CD which costs around \$ 40 with a system configuration around \$ 10,000.



Figure 2. *The First Emperor of China* - Photo-CD

Clearly, we have entered the digital environment, and have witnessed the fading electronic boundaries among text, picture, sound, and moving image, and the coming of multimedia information age.

A few words should be said about information seeking from the users' side. For centuries, we have been conditioned to access information mainly through printed sources. Because non-print information sources could not be readily available to us, we have trained ourselves either not to seek or to offer information available in those formats. Now, with text, picture, sound, and moving image all available in digital form, we clearly see the fading electronic boundaries among them. Once information is being presented in digital format, both the applications developers and users can retrieve the needed information easily, can cut-and-paste as they wish, and can also manipulate it in whatever way they see fit. Taking image as an example, an analog image can only be presented in its entirety as one frame of picture, while a digital image can be stored as a file and retrieved as such as well. Depending on the resolution and scale it is stored in digital format, it presents its

users endless possibilities for processing in any way relevant to the users' need, such as zoom in, zoom out, flipping horizontally or vertically, "fat-bit" in looking at each individual pixel, etc...

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