Imagine that you need information about a painting by Picasso and you know it's in the National Gallery of Art. You don't remember the title or the year it was painted, but you desperately need to see both the painting and information about it. Where would you look? Suppose that you wanted to analyze a certain shot from Alfred Hitchcock's film *North by Northwest* frame by frame. How could you find and analyze the shot?

The answer to both of these questions could begin with the flip of a switch and the insertion of a disc. Videodisc technology is coming into its own, not only as a superior digital presentation medium, but as a unique information retrieval system. This article explains how videodiscs process information and shows how, by mimicking other technologies, they have been applied to instructional and information retrieval tasks.

**Laser-Optical Storage Technology**

Laser is an acronym for Light Amplification by Stimulated Emission of Radiation. White light is a mix of all colors propagating incoherently (the waves going in all directions, interfering with and cancelling each other) and is quickly scattered and diffused. Laser light, on the other hand, is monochromatic (consisting of a single color and wavelength) and coherent (all the waves in phase, moving together and reinforcing one another). A laser produces an arrow beam which can be used to encode and decode signals. Early lasers used ruby rods or tubes filled with gas to produce the lasing effect; today's compact disc players use solid-state diode lasers.

Laser-optical storage can be transmissive or reflective. In a transmissive system, the laser light passes through a transparent spinning disc with dark lines containing the encoded information. The modulated beam falls on a sensor on the other side of the disc. In the reflective system, used in CD-music, CD-ROM (Compact Disc - Read Only Memory) and videodiscs, the laser light strikes a metallic coated disc which has been etched in concentric circles with a series of "pits" and "lands" and is reflected back to a sensor on the same side of the disc as the laser. The metallic coating gives these reflective discs their characteristic mirror-like surface. Current laser-optical discs are a playback only technology. (Record/Playback discs are nearing final development.)

In addition to high-density, stand-alone storage applications in the library and information market, compact discs have transformed the recorded music industry. The record store at your local mall has replaced most of its record bins with bins full of compact discs. Widespread consumer acceptance of compact discs foreshadows the next medium conversion to take place on the shelves of your favorite videocassette outlet.

**Videodisc particulars**

The videodisc provides a portable, convenient means of playing back video programs. A videodisc player can be attached to a television as easily as a VCR. But the videodisc produces a strikingly improved television image, and greatly enhanced sound quality. Since nothing touches the disc during playback except a low-energy beam of light, videodiscs show none of the wear videocassettes and motion picture film do during normal use. Videodiscs also require no rewinding.

But what is of greatest interest to educators is the powerful and flexible content access that videodiscs provide over videotape. There are two types of videodiscs, CLV and CAV. Continuous Linear Velocity discs spin less rapidly as the read head moves from the center to the edge of the disc, sweeping out the same length segment of arc with each turn of the disc. CLV discs store up to sixty minutes of program material per side, which can be time-indexed to the second. Continuous Angular Velocity discs, on the other hand, spin at a constant rate, which means the read head sweeps a longer segment of arc as it moves to the disc's edge. While they provide less program storage than CLV discs, CAV discs can be...
indexed frame-by-frame.

Videodisc interactivity is assigned based on the level of automation the system offers to retrieve the data. Users of level I discs manually use either the front panel controls or the hand controller to move to different points on the disc via play, scan, or search commands. Most home videodisc players are only capable of level I play, so it follows that most of today's discs are at this level. Level II discs require a player with a built-in microprocessor to execute programming encoded onto the disc at the time of manufacture. Level III videodiscs require a player controlled by an external computer, with the player and disc serving as a peripheral information storage and retrieval device.

The fact that each videodisc frame can be directly accessed gives this medium a powerful edge over its tape counterparts. Unlike videotape, videodisc users can immediately jump to any spot in the program and, once there, hold that frame on screen as long as desired, without damage to either the disc or the player. This ability has been exploited in a number of imaginative ways to produce videodiscs which can serve as information retrieval systems.

**Retrieval examples**

The early uses of videodiscs involved level I operation. The first videodiscs of the late 1970's were meant to compete on the home video market. Feature films were marketed, with disc's dramatically clearer video and audio signals trumpeted as its advantages over tape. However, most people used VCR's to time shift programs, recording them for a later, more convenient, playback, and discs could not record.

But the advent of compact disc audio technology and the merging of digital audio and video into a single high-performance entertainment system brought new life to the videodisc. Large-screen TVs made the resolution difference between discs and tape far more apparent than on conventional sets. CD-ROM applications in the information world also transferred over to the videodisc, where information retrieval on discs had a clear advantage over tape.

Retrieval in the CLV format is more limited than in CAV, and many disc players cannot hold a still frame on CLV. However, chapter stops can be placed on CLV discs, and these provide broad accessibility to major parts of the disc program. The Disney film *Mary Poppins* (Pioneer 023 AS) includes a chapter index on the back of the slipcase showing that five chapter stops have been included on each side, many at the beginning of songs. Similarly, the Metropolitan Opera's performance of *Tosca* (Pioneer Artists PA-86-158) provides chapter stops at each aria, duet, or other significant point in the performance, and they are indicated in the accompanying libretto. All musical performances issued in videodisc have chapter stops at the beginning of songs, much like CDs. *Simon and Garfunkle: The Concert in Central Park* (CBS/FOX 7133-80) lists a chapter stop at the beginning of all 20 songs, making it essentially a CD with video. The quality of the sound and the similarity of musical videos to CDs have made today's videophile as discriminating a music purchaser as the audiophile of a few years ago.

Another disc making good use of the chapter stop for information access is *King: Montgomery to Memphis* (Pacific Arts ID5335PA). This is a re-issue of a program originally released on 16mm film, but the videodisc allows the user to directly access all of the speeches of Dr. King, something that would be very difficult to do with the film.

While CLV is now accessible to the second, for access and information storage down to the frame level, CAV is required. One of the earliest attempts to use CAV for dense storage is the 1983 *National Gallery of Art* disc (VPI-NGA-84). Side 1 is a twenty-two minute "History of the National Gallery of Art." Side 2 contains 1645 art works, each with an explanatory panel following, on the first 3353 frames. The explanatory frame contains the artist's name, nationality, and dates; the title, date, medium, and size of the work; and the museum donor. A disc insert has an index of the works by author and gives each work's frame number. To find Auguste Renoir's *Woman in a Park*, you search frame 1282 and the image of the painting pops onto the screen. The insert also lists the chapter stops and shows that the paintings were arranged on the disc by "schools." To scan through French paintings of the 19th century, selecting chapter 9 will bring you to frame 1093, the beginning of this school. A twenty-seven minute tour of the Gallery follows the frames of individual works and includes motion sequences of 23 works.

*The Vancouver Disc* (Voyager Press, ISBN 0-931393-13-2), created in 1983 as a research project, is "an electronic archive of Vancouver, Canada, from 1872 to 1983 consisting of 20,876 still pictures, 37 time lapse sequences and 600 section titles." It is a fascinating prototype of compact information storage and retrieval. Six thousand archival photographs, 2200 tinted postcards, 500 posters and 5400 art works are mixed with time lapse and slow motion film clips and a slightly unsettling tour of Vancouver at 1500 kph, all set to an up-tempo musical score.

As the 1980's reached mid-decade, information storage on compact discs in the form of CD-ROM found a niche as a ready-reference tool and index in libraries. Grolier issued its 1984 Academic American Encyclopedia in CD-ROM format as the *Electronic Encyclopedia*, and then experimented with a home application of the CD-ROM principle in 1985 by issuing it on videodisc, calling it the *Knowledge Disc*. It contained the entire 9 million words of the printed encyclopedia, but, like its CD-ROM cousin, had not a single graphic. The videodisc contains thousands of video frames of text, with access to them achieved by searching the table of contents for a frame number and then manually searching for the listed frame. You can also skim the encyclopedia by watching an indicator at the top left of the screen which shows your progress through the letters of the alphabet. The