

OPTICAL DATA STORAGE : A NEW FRONTIER

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The impact of technology on information began the day catalogue card was devised to store the bibliographic details of a book. Initially, the size of a catalogue card used to be 5x3 in. it was increased to 6x4 in. as need was felt to record more information. With rapid increase in the volume of scientific literature, microform replaced paper for storing information. With the advent of computers, it appeared that the problem of data storage and retrieval of information had been solved, but soon it was realized that even magnetic medium used for storing information was not sufficient, and floppy disc and hard disk offering higher capacity and fast retrieval were developed. But the race between the volume of information generated and the medium for its storage did not end there. Thus, a versatile medium of mass storage in the form of optical disc was found.

Optical data storage is a promising technology offering the advantages of high density of data, low storage cost, random access, and excellent archival quality of stability. It can handle all forms of data ranging from text, image, sound to computer systems, with the possibility of introducing new types of systems as well. The technology has potential use in areas ranging from public information services, museums, libraries, offices, hospitals, educational and training institutions, to large information network and databases.

Optical Storage Technology

There are two principal types of optical storage media-read-only and read-write. The read-only type is an optical videodisc, which uses standard video format, and the read-write type is an optical digital disc, which is used for computer mass storage. The read-write type, also called optical disc or digital optical recording (DOR) disc, is at present non-erasable, but erasable discs are expected to be available soon. These may use magneto-optic or phase-change property material for disc where the recording effect is reversible.

In optical discs, information is usually coded as microscopic pits on the disc surface. Laser is used for recording as well as reading. Laser being a coherent beam of light is focussed accurately on a minute area where local heating results in the formation of pits. On the disc, the pits are arranged in circular tracks and the disc is then coated with a protective layer.

Reading of information from the disc is done using a low-powered laser, which does not damage the disc recording. The pattern of pits is detected by the difference in the reflectivity. Pits and the reflective surface in natural light give a 'rainbow effect' to the disc, which looks like a silver coloured phonogram record.

Optical data storage technology has several advantages over magnetic media.

Since it uses laser and non-contact mechanism to read and record information, it is safe from damage by dust or wear and tear. Thus, it has longer life more than 10 years against four years for magnetic media. As the size of a micropit is much smaller than that of a magnetic crystal, more information can be recorded in the same space. Besides having a high storage density, optical discs are cheaper.

Optical Videodisc

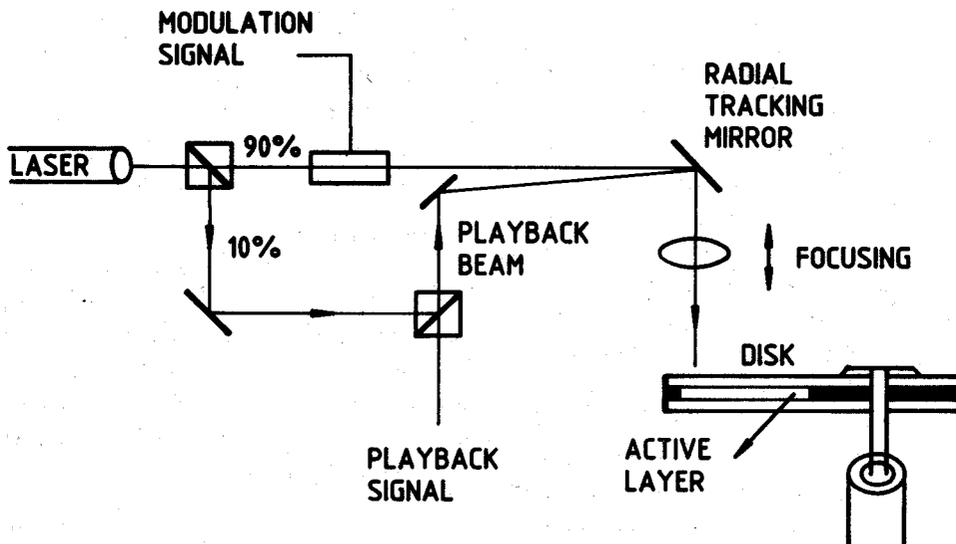
Optical videodisc can record both analogue and digital information, and has been put to entertainment and education/training applications. Since it is a read-only medium, the user can read the information, but cannot record his own information.

Videodisc is produced by a mastering and replication process. The material is first

recorded on a 2-in helical videotape. Master videodisc is then made by exposing the photosensitive surface of a glass disc to a laser beam modulated by the signal output from the videotape. Laser burns micropits on the surface of the disc.

This disc is then electroplated to form a nickel metal disc for embossing and stamping out replicate copies. Two of these reflective optical videodiscs are joined together to form a two-sided videodisc. The vinyl disc is then coated with a protective layer of acrylic. This process requires sophisticated equipment and controlled clean room environment.

The reading laser beam can be moved across the spinning videodisc at various speeds and directions without damaging the disc information. When the movement of the beam is properly synchronized with



the rotation of the disc, it produces a stable image on the TV screen. The playback facility also offers features like freeze-frame and slow or fast motion.

Optical Digital Disc

Although both videodisc and optical disc are of interest to information professionals, optical digital disc offers greater opportunity for development and use in information systems involving storage, retrieval and other management situations. Optical disc is considered as a digital storage device to store three forms of information—data, document and image. It uses direct-read-after-write (DRAW) technology, which allows machine-readable data to be recorded and played back with the user's own equipment.

Micropits are formed on a thin film of tellurium metal in the optical disc by a high-powered laser. The disc substrate is made of plexiglass having qualities of microscopic, flatness, uniform thickness, strength and superior optical properties. A 1-mm thick cover protects the disc from scratches, dust and fingerprints during handling. The finished product consists of two discs separated by annular spacers and sealed to make an air-tight construction.

Storage Capacity

A 12-in videodisc stores 54,000 frames of information, while an 8-in disc can store 18,000 frames of information on single side. One frame may be occupied by a picture, or a page of a document. Another

type of optical videodisc called constant linear velocity (CLV) can hold up to 108,000 frames (pages) of information, which is equivalent to 28 million bits of information.

The first optical disc with DRAW capability was demonstrated in 1978. One such disc can hold as much as one gigabyte (10,000 million characters) of information. If the superfluous white space on a typical page of a document is avoided, one 12-in disc can hold 40,000 pages without losing a single detail when reproduced. Sixty-four such DRAW discs can store 2.5 million pages and each stored document can be located in less than 5 sec.

DRAW disc allows random recording of information to any of the addressable sectors. The disc has the equivalent of 45,000 valuable tracks and is divided into 128 sectors. For making corrections in these write-once discs, new corrected data is written in a new sector on the disc; while the faulty sector remains, its address is removed from the computer memory.

Applications

Laser-read videodiscs have achieved a measure of success in educational and promotional applications. Videodisc is useful as an educational resource. Teachers could store enormous slide banks on videodisc and display their lessons. The videodisc can be controlled by a computer and programmed to display the slides in a set sequence.

Videodisc has possible use in libraries and museums. In libraries, manuscripts can be stored on videodisc whose resolution is as good as that of the original. Collection

of pictures, illustrations and engineering drawings is also possible. Micrographics is likely to be replaced by this technology, which has superior density characteristics, integration and ease in use, without the need for format, film processing and reading inconvenience. In museums, rare manuscripts and three-dimensional exhibits, archives of old slides, film clips and news reels can be stored on videodisc. An intelligent videodisc system connected to an external computer (interactive video) can be used by public information services to locate public places, such as libraries and tourist centres, and to provide information on local amenities, social security benefits, job opportunities, etc.

Interactive video also holds great promise for its role in education, training and information display systems. For example, in an engineering training concern, videodisc systems could be designed to train the staff on all aspects of the technology—quality control, financial planning and other training aspects. Intelligent videodisc systems are expected to use fiber optics, touch sensitive screens, and mini- and microcomputer technology to create an information system about the various activities and functions of the organization it serves.

Videodisc has a future in publishing too. The British Broadcasting Corporation intends to publish a record of life in Britain in the late twentieth century on videodisc. They will be putting two million pages of text on two videodisc with 30,000 still images, interactive graphics and maps. One disc will contain national statistical data, maps, etc. and the other one will

contain 'People's Database' produced by collating data collected by 10,000 schools.

Image Storage

Storing images of documents, photographs and graphics requires large bit capacities in digital storage. Image storage requires up to 200 times the bits required for text storage. One 2.5 sq in photo with a resolution of 200 bits per inch requires as much storage space as 5,000 digitally encoded words. Such information can be economically stored on videodisc which stores page image as analogue information. DOR disc, on the other hand, is useful for storing digital data, such as text and information, which need constant updating. Since it permits home recording, it is preferred for business and home, but data stored is unprotected unlike in videodisc which are read-only.

Digital optical recording discs are ideal for meeting the total information needs of offices with a large amount of information in various forms like logos, signatures, handwritten material, forms, correspondence, drawings and also voice messages which can be stored as digital voice. Data compression techniques are available with which the document can be compressed 10 times, eliminating the storage of extra white space on a page. They can be utilized in electronic filing cabinet or central file system in an automated office.

Currently, digital optical recording disc, is the preferred storage medium for scientific and technical publishers for electronic document and image delivery systems

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can lead to the development of individual theories and practices of editing.

13. Sussman, David

Composing photographs for technical journals

IEEE Tr Prof Commun 28(1), 1985, 3-12.

Photography is a two dimensional visual illusion of a three-dimensional world. The paper describes how with any two-dimensional media, art fundamentals and graphic control can be effectively applied, which can help to enhance a visual statement and make a image visually more appealing.

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for providing access to full text documents in stores. Videodisc is expected to be competitive with the online services for retrieval of machine-readable databases and graphics. The optical disk will be attractive to users, because besides reducing online storage costs, it facilitates creation of distributed mini-computer-based systems. The archival quality of optical discs combined with their ability to store page images and to permit hard copy printing, makes disc technology an ideal medium for library and information systems. In future, we may see paperless information storage and retrieval dominated by videodisc and digital optical disc.

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R-543 Electroslag ball-bearing steel in welding and special electrometallurgy by E O Paton. Institute of Electro-metal alloys. Chap IV.

R-544 Electroslag sheet steel. In welding and special electrometallurgy by E O Paton. Institute of Electro-metal alloys. Chap VI.

R-546 Instructions for calculations of avalanche loads for structural designing.

Swedish

SW-0033 Airforce chief's regulations for investigations of operational failure during military flying. Swedish Airforce Report No. FFS 1984-42, 28 pp.

Translation Bank

Seventeen new translations from different foreign languages into English were completed by this Centre and were added to the Translation Bank. These were indexed, classified and filed to facilitate retrieval through author, source and subject index.

About 338 photocopies of 16 translations were supplied by the translation bank to the indentors.