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Holographic Memory

Your personal computer stores information on the flat surface of disks built into its hard drive or placed by you on your computer's floppy disk, CD or DVD drive. To increase information storage, tech-

Photos courtesy of InPhase Technologies

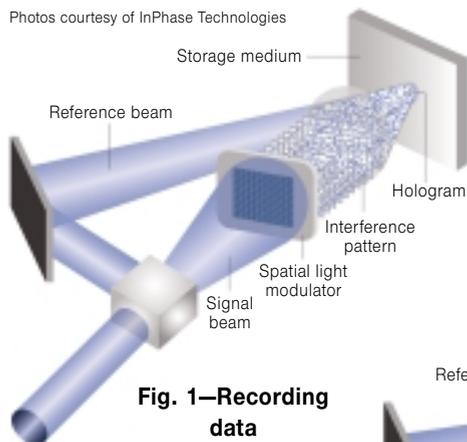


Fig. 1—Recording data

nologists have increased the density of the recording medium and the sensitivity of the read/write hardware found in each device. Blu-ray and HD-DVD recorders, just now entering the consumer market, increase recording density through the use of a blue laser as they record their data bit by bit on the surface of single- or multiple-layer disks.

The next breakthrough in disk storage may be holographic in nature. Technology ready for commercial use this year stores digital documents all at once, rather than bit by bit, as a three-dimensional pattern within the full volume of its recording disk. The new holographic data storage (HDS) drive can transfer and store 128 hours of video on a single disk in as little as three hours.

To record a document, the document's data is converted from 0's and 1's into a million-bit optical pattern beam of light. The beam is then intersected with a reference laser beam. The interference pattern created by the intersecting beams

records the document as a hologram through a chemical reaction in a volume location, not just on the surface of the photopolymer light sensitive disk. The software and drive components vary the location on the disk as well as the reference beam angle and wavelength to record hundreds of thousands of different holograms to the same disk (Fig. 1).

To read the data back from the disk, a new reference beam strikes the disk at the location of the stored hologram. This beam interacts with the stored

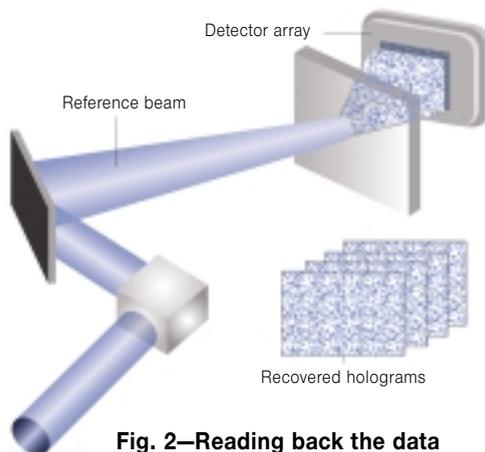


Fig. 2—Reading back the data

hologram and its reflected light now contains the original interference pattern of the stored data. The optical pattern of the reflected beam is read in parallel rather than bit by bit. Parallel reading of the full optical pattern allows for much higher transfer rates than with bit-by-bit transfers (Fig. 2).

Bell Labs originally developed the technology. Bell has spun off InPhase Technologies to bring it to market. I asked Liz Murphy, a spokesperson at InPhase, how soon we can expect to see consumer holographic drives. I think you will find her answer quite interesting.

"About 2.5 years were required to migrate from the first rev to what we have today, and the changes

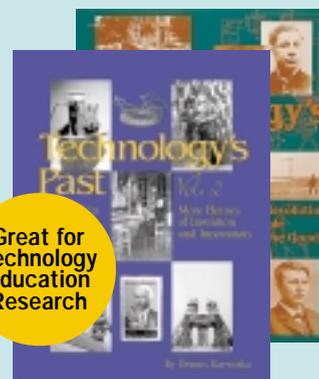
were monumental. We will ship the first units for customer evaluation at the end of this year. However, the units are targeted at professional applications, not consumer applications. The things that make it attractive to the general public are low cost and ease of use. It will take several years to get a similar device into a true consumer format, and that is likely to be done by consumer electronics companies that would license the holographic technology [from InPhase]."

Recalling the Facts

1. How does holographic storage differ from current storage technologies?
2. Describe how a digital document is transformed into a stored holographic image on a disk.
3. Describe how a stored holographic image is retrieved from the holographic disk. ©

Alan Pierce, Ed.D., CSIT, is a technology education consultant. Visit www.technologytoday.us for past columns and teacher resources.

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