HOLOGRAPHIC MASS STORAGE SYSTEM

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ABSTRACT

Holographic data storage is a potential technology in the area of high capacity data storage currently dominated by magnetic data storage and conventional optical data storage. Holographic memory is a technique that can store information at a high density inside crystals. It can store up to 1TB in a sugar cube size crystal. Data from more than 1000 CDs can fit into a holographic memory system. It has more advantages than a conventional storage system.

This paper provides a description of holographic data storage system (HDSS), a three dimensional data storage system which has a fundamental advantage over conventional read/write memory systems. A brief overview of properties of holograms will be presented first. Applications to computer systems are then covered, with the future of holographic memory presented as a conclusion.

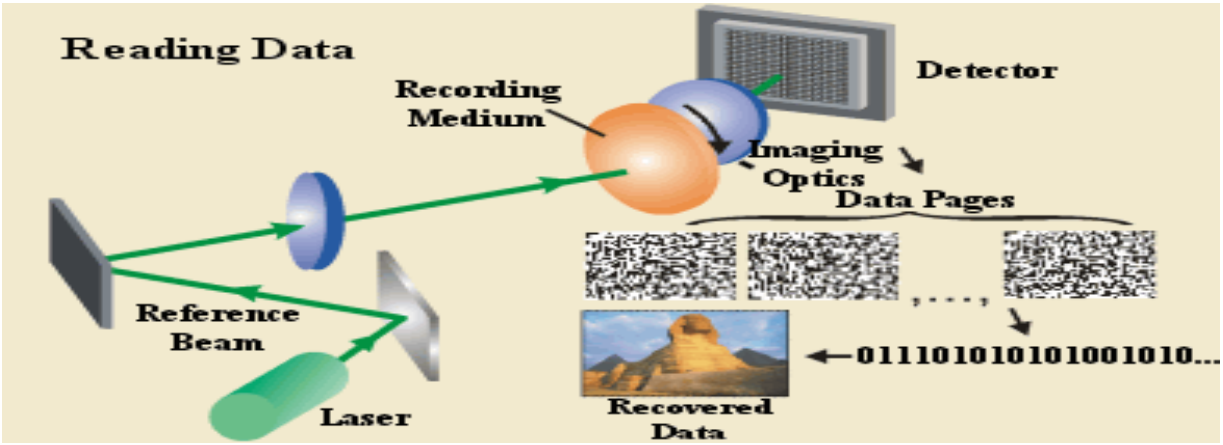
INTRODUCTION

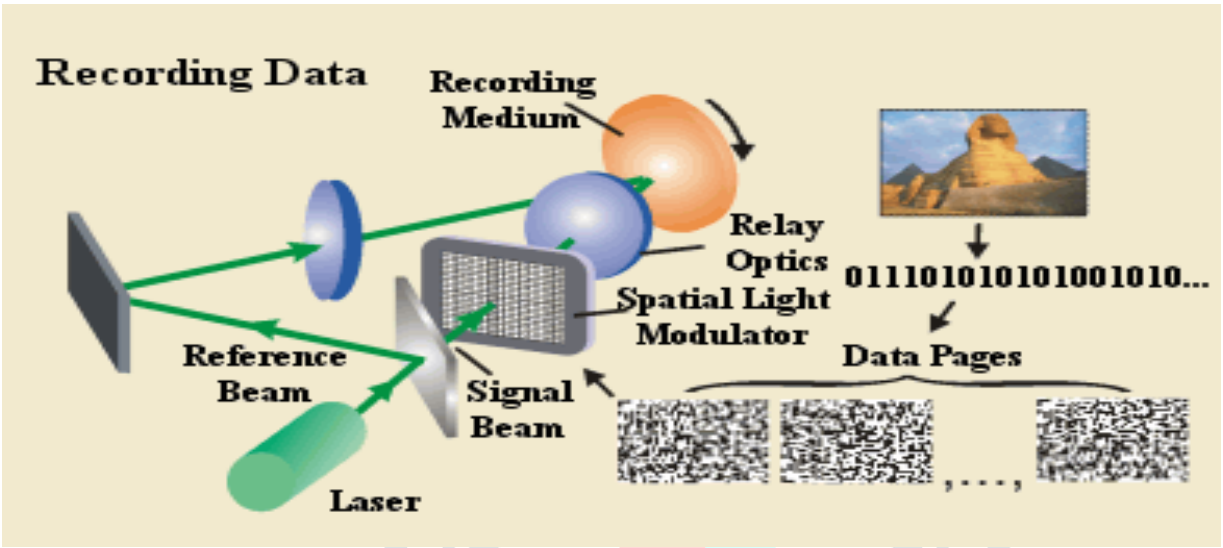
Holographic memory system is a technique that can store information at high density crystals or photopolymers as a current storage techniques such as DVD reach the upper limit of possible data density (due to diffraction) holographic storage has the potential to become the next generation of storage media. The first step in understanding holographic memory is to understand what "holographic" means, holography is a method of recording patterns of light to produce a 3D object. The recorded patterns of light are called memory system.

METHODOLOGY

WORKING OF HDSS

Creating holograms is achieved by means of 2 coherent beams of light split from one laser source, one being the reference beam and the other signal beam. When both the beams interfere with one another, a resulting interference pattern is formed which encompasses the pattern both in amplitude and phase information 2 beams, when an appropriate photorefractive material is placed at the point of interference,the interference patterns are recorded inside the material. The beam's angle is crucial and it can't vary by more than a fraction of degree. The apparent flaw in the recording process is actually an asset it's how holographic storage achieves its high data densities. By changing either the angles of the reference beam or its frequency we can write additional data pages into the same volume of crystal, the dynamic range of the medium determines how many pages it can hold reliably When the reference beam illuminates the material in the absence of the signal beam, the hologram causes the light to be diffracted in the same direction of the initial signal beam and all the information of the original signal beam is reconstructed.





MULTIPLEXING

The properties of hologram provide a unique solution. Holographic memories store information throughout their whole volume. The way of sorting multiple pages of data in the hologram is called multiplexing. The thicker the volume becomes smaller the modifications to the source can be.

IMPLEMENTATION

A holographic data storage consists of a recording medium, an optical recording system, a photo detector. The recording medium is usually a photorefractive crystal. A hologram is simply the 3D interference pattern of the perpendicular toeach other. The most common holographic recording system uses laser light abeam splitter to divide the laser light intoreference beam and signal beam, various lenses and mirrors to redirect the light, a photoreactive crystal and an array of photo detectors around the crystal to receive the holographic data. The possibility of the hologram that has the property that if it is illuminated by either of the beams used to record it, the hologram causes light to be diffracted in the direction of the second beam that was used to record it, thereby recreating the reflected image of the object if the reference beam was used to illuminate the hologram

POSSIBLE APPLICATIONS

There are many possible applications of holographic memory. Holographic memory systems can potentially provide the highspeed transfer and large volumes of future computer system.

Data mining – It's the processes of finding patterns in large amounts of data it is used greatly in large databases.

Petaflop computing – A petaflop is a thousand trillion floating point operations per second holographic memory could be utilized in a petaflop architecture.

CONCLUSION

The future of holographic data storage is very promising; HDSS provides a window into next generation computing by adding another dimension to stored data. Current magnetic storage devices remain far more cost effective than any other medium on the market. The parallel nature of HDSS has , many potential gains on serial storage methods, however, many advances in optical technology and photosensitive materials need to be made before finding optical technology and photosensitive materials need to be made before finding holograms in our computer system.

POTENTIALS AND PROBLEMS

Unlike current storage technologies that record one data bit a time, holography allows more than a million bits of data to be written and read in parallel withasingle flash of light. High 3D storage densities, fast transfer rates and durable media make holography the most likely choice for next generation data storage and processing needs. Only magnetic tape can compete with holographic storage capacities to some extent, but tapes are less durable and harder to access. A prototype holographic system has lately been demonstrated to have a recording capacity of 515 GB per sq inch, the prototype could store up to 150 million pages, which is more than the capacity of 60 DVDs or 1000 CDs.

- Per megabyte cost of the media is low.
- The life expectancy of recorded data is 50 years.
- Random access to stored data is the standard method.
- Capabilities for improving information security are higherthan current technologies.
- The cost levels are not yet competitive for large scale market acceptance of holographic memory products.
- Despite these and similar negative points, the researchers and producers of the holographic technology are confident about the success of HDSS in the near future.

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