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Optical Computers for Volatile Optical Memory Using Solutions Waves

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ABSTRACT

With the increasing popularity of multimedia, optical computers are an information processing apparatus that uses light, discusses distinctive characteristics of light as an electromagnetic wave of the light by several order of magnitude higher frequencies of electrical signals and waves used in modern computer technology. The speed of processing can be increased if the electronic devices are replaced by optical devices, thus avoiding the time taken by the opto-electronic converters. As using an optical Random Access Memory (RAM) which plays an important role in determining the processing speed optical RAM which plays an important role in determining the processing speed. This paper is discussion the technique for implementing volatile optical memory RAM and this will be very helpful in making a fast optical processor.

Keywords: **Solution, optical memories, optical processors.**

Introduction

Optical computers are an information processing apparatus using light. When discussing distinctive characteristics of light as an electromagnetic wave, it should be noted that the frequency of the light wave by several order of magnitude higher frequency of electrical signals and waves is used in modern computer technology. Thus, if the electric wave that is used, for example, in radio, makes about 100 thousand cycles per second, the light wave has a frequency that is 10-100 million times more than the electric wave value. With the help of a fixed period of time you can transfer more signals and as a result, more information. Also, the wavelength of light is very small, there is a possibility of information processing with an unusually high rate (Alper D et al , 2007). Recently, there has been great excitement around the optical computers.

We believe that optical computers are now at the same level of development with neuron-computers and quantum computers. However, there is a belief among experts that the optical computer in “pure” form is not yet developed. At the moment there is only electro-optical computer. Indeed, in the Von Neumann, architecture computers are widely used optical phenomena’s (Benabid F et al , 2008)In recent years, one of the most significant trends in computer architecture has been the continuing increase in internet topic growth, which is problematic for high capacity routers whose switching capability is limited by electronic constraints. The memory can instead be implemented with a loop of optical fiber around which the signal recalculates. (Charlet,G.et al , 2007)

The storage mechanism is transparent to the bit rate, which can exceed 100 Gb/s. This Optical Memory Loop (OML) must allow data to be switched in, recalculated with little distortion, and switched out. The principle function of reading information from an optical disk is to irradiate the surface of the disk with a laser beam, and the removal of information by the reflected light from the disk surface. In the future, there will be a displacement of magnetic optical memory that is used in classical computers. The transmission of information through an optical fiber is to spread the light on it. Since fiber optic cables do not emit in the radio, passing information on them is difficult to eavesdrop without breaking round-trip. The use of optical means of communication benefit more than the usual electric transmission. Construction of optical processors based on traditional principles calculations encounter great difficulties, which is shown in Figure 1.

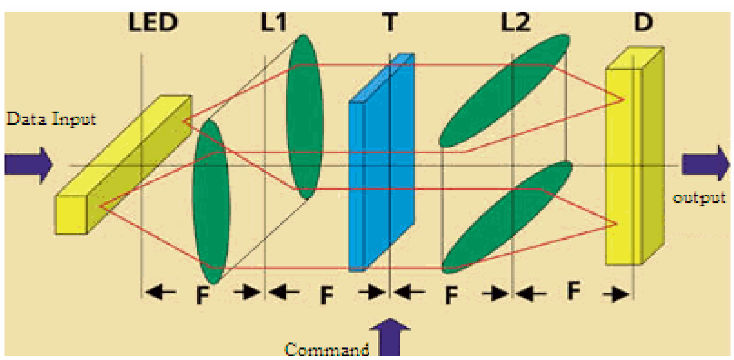

Fig.1: Optical system - CPU, liquid crystal

Since progress in the construction of optical processors has not been fast enough, developers have been forced to look for other architectures. If electronic massively parallel supercomputers with ultra-push were developed, then optical computers could be considered for the efficiency and versatility. We propose to move forward with the optical system research in order to process complex algorithms. Optical element base is perfectly combined with the architecture of artificial neural networks, which are capable of learning and self-learning. Built on the traditional cell-based in recent times, coherent and incoherent special processor, including optical correlations, are well established in some important areas, up to aerospace navigation. Much in the technical implementation covers the veil of mystery: the secrecy due to military applications (Govind P et al , 2007)

This paper introduces the implementing volatile optical memory RAM technique. This paper will be organized as follows: section 1, introduces the concept of optical computers; section 2, provides the literatures and related works; section 3, presents the solutions waves; section 4, presents the results & discussions; section 5, concludes the paper.

Related Works

There are several sources of loss in any fiber loop: fiber attenuation (0.2 dB/Km at 1550 nm), insertion loss of the switch, and the loss associated with the other elements in the loop, which may include an optical isolator, a band pass filter, a polarization controller, and a monitoring tap. To compensate for these losses, an optical amplifier such as an Erbium-Doped Fiber Amplifier (EDFA), can be used. Unfortunately, the EDFA amplifies noise as well as signal. Thus, the signal power must be kept well above the noise power, so that the signal will take all of the gain provided by the amplifier. The communication revolution of this era demands fast and reliable data transfer from transmitter to receiver (G. Charlet et al, 2007)

Optical networks have become an essential requirement in keeping the pace of development for any memory system. There are few factors for optical memories that may corrupt the data while being recorded, retained or read out from the optical memory. For example system and the material noise, optical effects such as reflection, diffusion and inter-pixel crosstalk due to additive noise Gaussian amplitude and Mechanical noises, sources one of the emerging technologies in optical networks is soliton. Soliton are localized nonlinear waves that have highly stable properties that allow them to propagate very long distances with very little change [1, 3]. The model equation for this technique is presented in nonlinear Schrodinger equation. More detailed information about this equation is given later in the paper. (Benabid, F et al , 2007)

Solutions Waves

The model equation that describes the properties of the surface wave in far field lower-order dispersion and nonlinearity. When the equation is solved numerically, a lot of solitary waves it was found there and steadily through each other. They are called solitary waves solutions because of their stability. Solution was acquitted when the KdV equation has been solved analytically by Inverse Scattering (IST). The decision has been described many solution are considered the basic unit regime in a nonlinear dispersive medium and play a role similar to the Fourier Linear Medium (FLM). In particular, the solution can be defined as the Eigen values in the IST support its particles (fermions) concept. A similar solution was found reach balance cubic nonlinearity. Model equation, called the nonlinear Schrödinger Equations, as well as through inverse scattering and the solution is given a set of solutions and dispersive waves (Haichuan Z et al , 2007)

Results & Discussions

Nonlinear Schrodinger equation:

$$\frac{\partial a+(t,z)}{\partial z}=-\frac{B2}{z}\frac{\partial^2 A(t,z)}{\partial t^2}+\frac{B3}{6}\frac{\partial^3 A(t,z)}{\partial t^3}-\frac{\alpha}{2}A(t,z)+I\left[\gamma\left|A(t,z)^2 A(t,z)\right|\right]+\frac{i\partial(\left|A^2\right|A)}{\partial t}-TR\frac{(\left|A\ \right|^2)A}{\partial t}$$

$$\frac{\partial A+(B1}{\partial z}\frac{\partial\ \ A}{\partial t^2}+\frac{i}{2}\frac{\partial^2 A}{\partial t^2}+\frac{\alpha A}{2}=I\gamma\left|A\right|^2 A$$

$$T=t-b1z,\alpha=0$$

$$i\frac{\partial A}{\partial z}-\frac{1}{2}B2\frac{\partial^2 A}{\partial t^2}+\gamma\left|A\right|^2 A=0 \qquad (1)$$

Where, *A* = complex amplitude of the signal, *Z* = propagation distance, α = attenuation coefficient, *B2* = group velocity dispersion coefficient, γ = nonlinearity coefficient, *T*= t-BLZ= t-z/vg. “This is the time measured in aframe of reference moving with the pulse at the group velocity vg”, *B*1= propagation instant along z.

Solution of the equation produces solutions, under ideal conditions, higher-order solutions’ forming inside optical fiber exhibit periodic evolution such that the optical pulse recovers it shape after a distance known as the solutions periodic [2], and this produces stable propagation. The inverse scattering method shows that the power and width of the k^{th} solutions are related to the solution order (*N*) as in (Haichuan Z et al , 2007).

$$PK=p_0(2N+1-2k)^2/N^2 \qquad (2)$$

$$TK=T_0(2N+1-2k) \qquad (3)$$

Where, P_0 = input power, T_0 = input pulse width.
The most energetic solution (*k=1*) which has the shortest temporal width (known as Raman solution).

Conclusion

Optical memory is an ideal solution for storing large quantities of data very fast and transporting that data between computer devices; therefore, one can use the equations of propagation of solutions to build a volatile memory system for an optical processor.
A graded index optical fiber can be used to trap optical solution pulses that circulate through the fiber, and if we make the length of the fiber greater or equal to the solution period, this yields stable circulation of solutions' keeping their shape and amplitude constant. Trapped solution pulse can be considered as a smallest unit of the optical memory (optical bit). The presence of the soliton can be interpreted as logical "1" and its absence is logical "0". The storage time can be determined by its length of the fiber making the loop. This can be realized by using a flat sheet of fiber optic material with variable refractive index that will direct the soliton wave to circulate in around the loop through total internal reflection.

If the standard frequency of the soliton pulse is (10) T_{HZ}, and the circumference of the optical loop is equal to the wavelength of the pulse, thus (1) sq.cm. Of the flat optical material can contain a storage capacity of more than (10) million optical bits. Multiple letters of this material can increase the storage capacity.

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