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Optical Computers

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***Abstract*-- In the fashionable age laptop should perform tasks like the speed of sunshine, in order that it's ready to management automaton in area, 50 million kilometers away. This cause the thought to make AN "Optical Computer", that job open on lightweight (photons) rather than electrons or combination of each. Research is fully progress into a next generation laptop utilizing the properties of sunshine. The alleged "Optical Computer" of the longer term is that the subject of dialogue by researchers everywhere the globe, on its potentialities and issues on the thanks to realization.**

I. INTRODUCTION

An optical computer is a computer that performs its computation with photons as opposed to the more traditional electron-based computation. Optical computing includes the optical calculation of transforms and optical pattern matching. Emerging technologies additionally build the optical storage of information a reality. The speed of computers was achieved by miniaturizing electronic parts to a really little micron-size scale, however they're restricted not solely by the speed of electrons in matter (Einstein's principle that signals cannot propagate quicker than the speed of light) however additionally by the increasing density of interconnections necessary to link the electronic gates on microchips.[1]

II. PREVIOUS WORKS IN THE FIELD

Optical computing was a hot analysis space within the Eighties. But the work tapered off attributable to materials limitations that gave the impression to forestall optical chips from obtaining sufficiently little and low cost enough to be over laboratory curiosities. Now, optical computers square measure back with advances in self-assembled conducting organic polymers that promise super-tiny all-optical chips. Advances in optical memory device have generated the promise of economical, compact and large-scale storage devices. Another advantage of optical methods over electronic ones for computing is that parallel data processing can frequently be done much more easily and less expensively in optics than in electronics.

Parallelism, the capability to execute more than one operation simultaneously, is now common in electronic computer architectures.

But, most electronic computers still execute directions sequentially; correspondence with physical science remains sparsely used. Its 1st widespread look was in Cray supercomputers within the early 1980's once 2 processors were utilized in conjunction with one shared memory. Today, massive supercomputers might utilize thousands of processors however communication overhead ofttimes leads to reduced overall potency.[5]

Consider AN imaging system with one thousand ´ one thousand freelance points per mm2 within the object plane that ar connected optically by a lens to a corresponding variety of points per mm2 within the image plane; the lens effectively performs Associate in Nursing FFT of the image plane in real time. For this to be accomplished electrically, a million operations are required. Parallelism, when associated with fast switching speeds, would result in staggering computational speeds.[2]

On the opposite hand for a few applications in input output (I/O), like image process, by using a simple optical design an array of pixels can be transferred simultaneously in parallel from one point to another. Optical technology guarantees large upgrades within the potency and speed of computers, as well as significant shrinkage in their size and cost. An optical personal computer can be capable of process information up to one hundred,000 times quicker than current models as a result of multiple operations will be performed at the same time.[4]

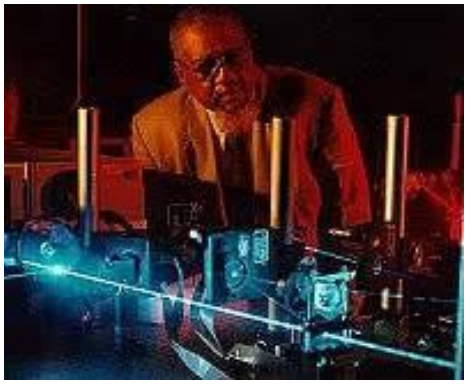

Figure 1: Dr.Donald frazier monitoring a blue laser light used with electro-optical computer

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III. LIMITATIONS

1. Today's materials need abundant high power to figure in shopper product, arising with the proper materials might break years or a lot of.[3].
2. Optical computing employing a coherent supply is easy to cypher and perceive, however it's several drawbacks like all imperfections or mud on the optical parts can produce unwanted interference pattern due to scattering effects. Incoherent process on the opposite hand cannot store part info.

IV. STRENGTHS

1. Optical computing is a minimum of one thousand to a hundred thousand times faster than today's silicon machines.
2. Optical storage will provide an extremely optimized way to store data, with space requirements far lesser than today's silicon chips.
3. Super fast searches through databases.
4. No short circuits, light beam can cross each other without interfering with each other's data.
5. lightweight beams will travel in parallel and no limit to variety of packets which will travel within the photonic circuits.
6. Optical computer removes the bottleneck in the present day communication system.[2]

V. CURRENT RESEARCH

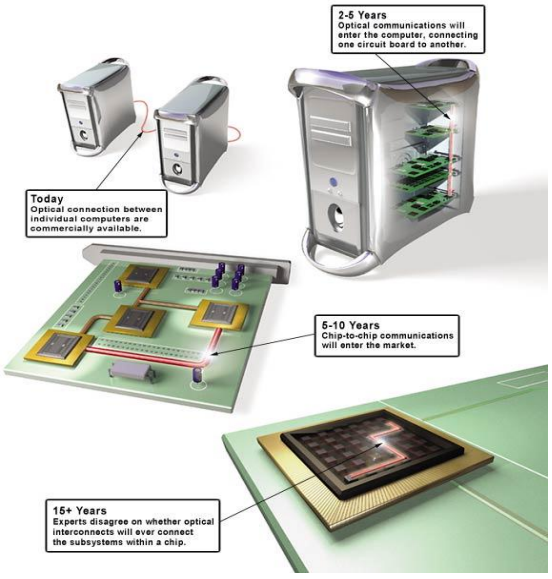
High performance computing has gained momentum in recent years , with efforts to optimize all the resources of electronic computing and researcher brain power in order to increase computing throughput. Optical computing can be a subject of current support in many places , with private companies as well as governments in several countries encouraging such research work.

A group of researchers from the university of southern American state , jointly with a team from the university of California , los angles , have developed an organic polymer with a switching frequency of 60 GHz . this is thrice quicker than the present business customary , lithium niobate crystal based device. Another cluster at Brown University and therefore the IBM , Almaden research center has used ultrafast laser pulses to build ultra fast data storage devices . This cluster was ready to attain immoderate quick shift all the way down to one hundred unit of time.

In Japan , NEC has developed a way for interconnecting circuit boards optically exploitation VCSEL arrays. Another researchers at NTT have designed Associate in Nursing optical backplane with free-space optical interconnects using tunable beam deflectors and mirrors. The project achieved one thousand interconnections per computer circuit board; with a through place starting from one to ten Tb/s.

VI. FUTURE TRENDS

The Ministry of knowledge Technology has initiated a photonic development program. Under this program some funded comes area unit continued in fiber optic high-speed network systems. Research goes on for developing new optical maser diodes, photodetectors, and nonlinear material studies for quicker switches. Research efforts on nanoparticle skinny film or layer studies for show devices also are current. At the Indian Institute of Technology (IIT), Mumbai, efforts area unit current to come up with a white light from a diode-case based mostly fiber electronic equipment system so as to produce WDM communication channels.



VII. CONCLUSION

Research in optical computing has opened new prospects in many fields associated with high performance computing, high-speed communications.

To design algorithms that execute applications quicker the precise properties of optics should be thought of, like their ability to take advantage of huge correspondence, and world interconnections. As optoelectronic and good pel devices mature, computer code development can have a significant impact within the future and therefore the ground rules for the computing might have to be compelled to be rewritten.[1]

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