Photonic Computer: A Next Generation of Computer World

Lakshmi Nath Bhattarai
Department of Physics, Butwal Multiple Campus, Butwal
lakshmibhattarai@hotmail.com

Abstract

Software in the computer are used to study from sub-atomic particles to lagre scale strucute like galaxies. Computer technology found to make computer small and as fast as possible. As photon travel tansfer than electric curren, time required for computation in photonic computer will be highly reduced and portable.

A computer is an electronic device which is used for processing raw data to get meaningful information with the help of program. Charles Babbage is regarded as the father of modern computer. At first, in 1822 he had made a machine named Babbage Difference Engine which could do calculation of numbers and was capable of printing mathematical tables. Later in 1835 he modified it to do other works like punching cards and named as Babbage Analytical Engine. ENIAC, first electronic computer was invented in U.S.A. in 1946 and was used by U.S. government in 1951.

The Apple expanded the use of computers to consumers in 1977. The IBM personal computer for consumers followed closely in 1981. In 1991, World Wide Web (www.) was invented in CERN, Switzerland/France by Tim Berners-Lee. The computer evolution since then continues. New uses of computers are emerging day by day every year.

The use of internet via computer and mobiles has made possible to send and receive large amount of data that may be text, video, photos etc. at a single click within a fraction of second from one place to other. Today internet facility has made world a small village. The computers are used to study subatomic particles in small to large scale structures like Galaxies in scientific world. The computer word is common among literate as well as illiterate people. It is common in every stream of life. It is used in banks, hospitals, schools, press, departmental stores, industries, homes as PC and even to play games and watch TV channels, etc. These computers have enhanced human life to a great extant.

The computers which we are using nowadays are all electronic computers. They use electronic components like resistors, inductors, capacitors, semiconductor diodes, transistors, logic gates etc. In the early computers these components were used individually as a result the computers were large in size. When integrated circuits called IC were developed in which large number of above mentioned components could be fabricated in very small size of silicon wafer, the size of computers and other electronic devices reduced amazingly. Technologists are trying to make computers as small and as fast as possible. Due to these efforts we are getting smaller as well as faster computers, laptops, mobiles etc. The desire of mankind is not decreasing. In the electronic devices the components are connected by Lithography in Silicon chips. This technology has several problems such as dielectric breakdown, hot carriers, short channel effects etc. Though this technology is reaching to its fundamental limit, the demand of light, small sized and high speed computers are increasing geometrically to solve the complex problems and use of fast internet.

To solve the limitations of electronic computers scientists are trying to incorporate *photonics* in the computers. The photonics is the branch of physics in which photons (packets of light energy) play the same role as electrons do in electronics. Photonics is in use of data transferring from one place to other by using optical fiber and laser. The use of optical data transfer has revolutionized the communication world. By using a single thin thread of optical fiber thousands of conversation and data can be transmitted at a time without any cross-talk and noise. The use of cheap laser diodes has dropped the price of CD-ROMs. This has made CD-RW, DVD, MP3, laser printers, scanners, photocopiers etc. very common in home and office computers. These are some examples of use of photonics in transferring, storing and retrieving data.

The computers in which optical interconnections and optical integrated circuits are used for processing and transferring data and that uses the photons in visible light or infrared beams, instead of electric current, to perform digital computations are called Optical or Photonic computers. These computers are aimed to solve the problems arose in present electronic computers in their speed and size. In optical computers the metallic wires and layer of thin film will be replaced by few optical fibers. The semiconductor components, resistors, capacitors, inductors will be replaced by optical logic gates, optical resistors, optical capacitors and optical inductors.

The optical computers are immune to electromagnetic interference, free from electric short circuits, low loss transmission and capable of transferring several channels parallelly without any cross-talk. As photons travel very fast than electric current, the time required for computation in photonic computer is highly reduced. Calculations show that the computation that requires 11years in electronic computers would require less than one hour in photonic computer.

Thus, the development of more powerful processing systems by applying some of the advantages of visible and/or IR networks at the device and components a photonic computer might someday be developed that can perform operations significantly faster than a conventional electronic computer. The photonic computers that use the photonic components for storing, retrieving and processing data are aimed as next generation of computer.

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