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NANO COMPUTING AND ITS APPLICATIONS

S.A.ANCHAL JAIN[#1], POORVI .B.S [#2], CALABE .P.S[#3], MALASHREE.N[#4]
UG Student UG Student UG Student AsstProffessor

Department Of CSE, Visvesvaraya Technological University
CBIT, Kolar, Karnataka, India
Anchaljain2326[1]@gmail.com
chinnip8630[2]@gmail.com
calabalwar[3]@gmail.com
malachinmai195[4]@gmail.com

ABSTRACT

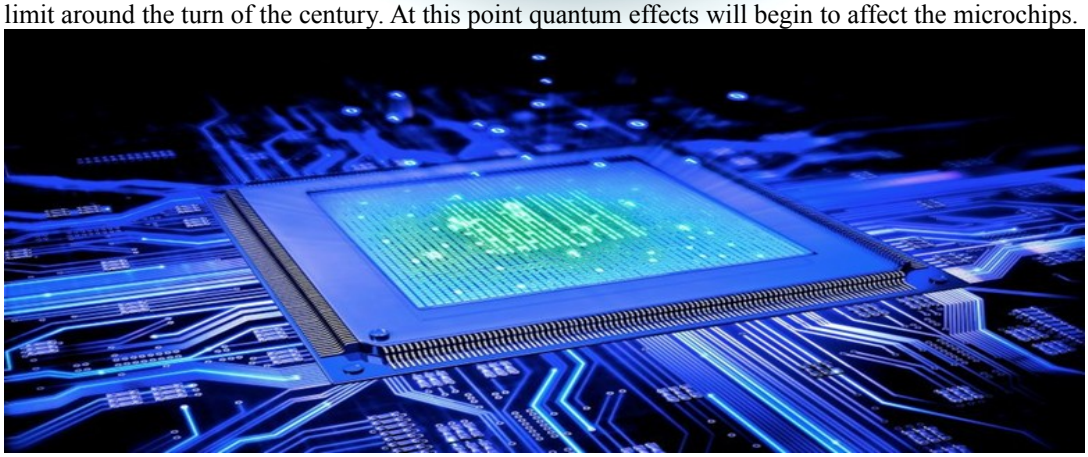
Nanotechnology is a new and broad area of study and research .This area of (study) research includes several fields like chemistry, physics, biology, computer science, engineering, forensic science etc. In this paper, we explore the recent development and applications of Nanocomputing. Nanotechnology is likely to play a very major role in the future in the field of computer science which may help in revealing new techniques of devices. Nanocomputing provides the potential for new and faster kinds of considerably responsible for revolutionize more technologies in computer science .This paper is enriched with detailed description of nanocomputing.
KEYWORDS: Nanocomputing, Moore'slaw, Quantumnanocomputing,Chemical-biochemical nanocomputing, Mechanicalnanocomputing.

INTRODUCTION

Nanotechnology is a branch of science and technology which deals with science of manipulating the matter at the nanoscale, deals with the dimension of approximately 1-100nm. Richard Feynman is the father of nanotechnology. Nanotechnology is the study and applications of extremely small things. Nanotechnology was coined in the year 1974 by NorioTaniguichiof Tokyo Science University to describe semiconductor s processes such as thin film deposition that deals with control on the order of nanometre. His definition still stands as the basic statement today i.e., "Nanotechnology mainly consists of the processing of separation consolidation and deformation of materials by one atom or molecule." Nanocomputing describes those components that uses extremely small or nanoscale devices.

DEFINITION OF NANOCOMPUTING

Nanocomputing is the miniaturisation of technology to thebillionth of a meter (the nanometre) to the molecular level. It is the design and manufacturing of intelligent miniature machines, programmed toperform specific tasks, new computer technologies will have to be found; current transistor technology will reach its size limit around the turn of the century. At this point quantum effects will begin to affect the microchips.



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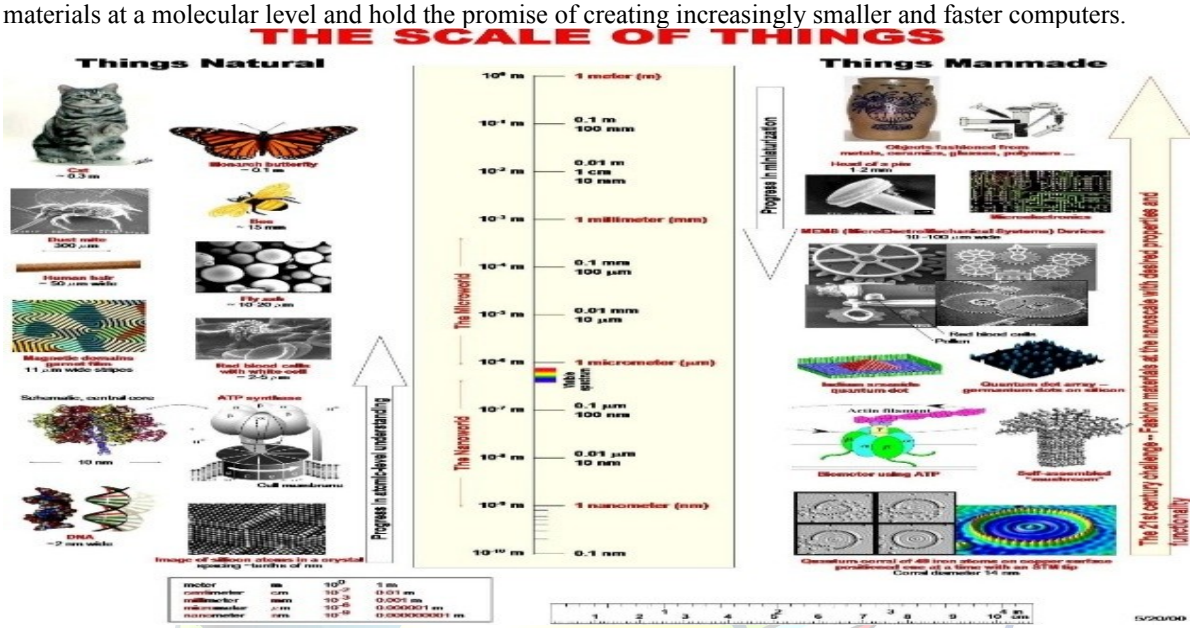
NANOCOMPUTING

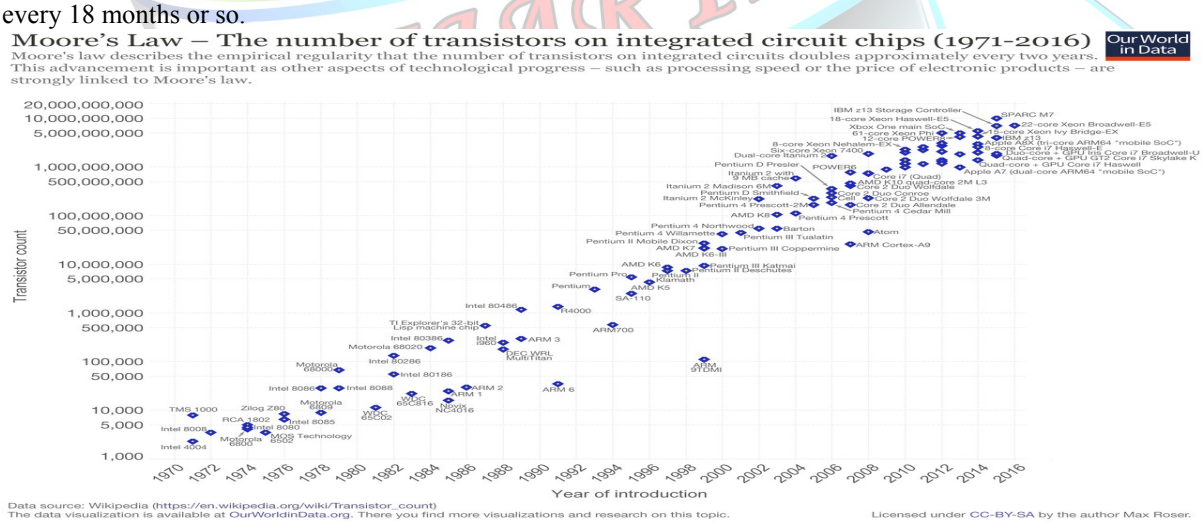
It was first coined for the SI MP3 Chipset manufactured by the flying electronic in computer .It is also called as quantum computer . They process and perform computations similar to standard computers but are sized in nanometres .Nanocomputing even manages and controls the nanorobotstechnology.
A computer with circuitry so small that it can be seen through a microscope. Nanocomputing deals with materials at a molecular level and hold the promise of creating increasingly smaller and faster computers.



In the computers industry the ability to shrink the size of transistors on silicon microprocessors will soon reach its limits of speed and miniaturisation. In 1960's, GordonMoore, one of the founders of INTEL, made an interesting comment about computer technology, which has come to be known as "MOORE'S LAW".

MOORE'S LAW

Basically Gordon Moore observed that the size for devices on a microchip decreased by A factor of two every 18 months or so.



According to Moore's law , the number of transistors that will fit on a silicon chip doubles every 18 months .Presently microprocessors have more than forty million transistors ;by 2012 they could have upto5 billions. By the year 2020 the trend line of Moore's law states that there should be a one nanometre feature size. His observation continues to hold level to this day. Fortunately, nanotechnology brings us some interesting, and very small, alternatives .Here we will briefly discuss the major avenues of research.

ELECTRONIC NANOCOMPUTERS

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It works in manner similar to the way prevent day microcomputer works. More number of transistors aresqueezed into silicon chips with each passing year, evolution in IC's increases the storage capacity and processing power. The speed and power of this have grown rapidly because of the invention of transistor in the year 1948, stores the information in the position of electron.

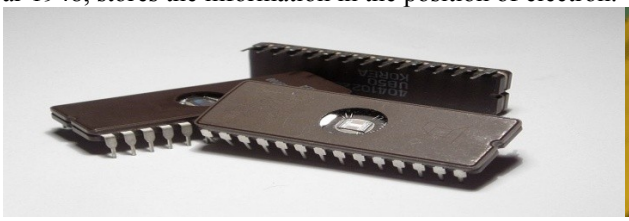
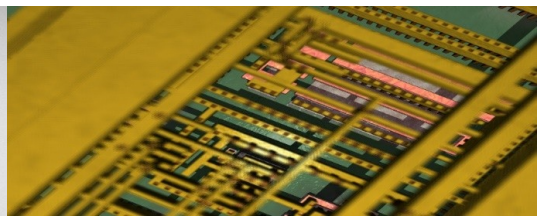

Fig:IC's Fig :Silicon chip

CHEMICAL AND BIOCHEMICAL NANOCOMPUTERS

CHEMICAL: This computer processes information by making and breaking chemical bonds. Stores large amount information resulting in chemical structures. Here the computing process is based on chemical reactions. [Formation and breakage of bonds]. Engineers need to be able to control individual atoms and molecules can be made to perform controllable calculations and data storage tasks.

BIOCHEMICAL: Even it stores the information in form of chemical structure and interactions .Exist in nature and manifest in all living things. These computers seen far off because the mechanism for poorly understood , Although medical science has come close to thin ideal in the formulation of vaccines ,antibiotics and antiviral medications but still it is poorly developed , to overcome this they invented a new technique called DNA nanocomputing .

Fig : DNA nanocomputing

In the year 1994, Leonard Adelman used this technique to compute the solution to a complex graph theory problem. These computers are DNA to store information and perform complex calculations. Has vast amount of storage capacity. Single gram of DNA can hold as much as information as one trillion compact disks.

MECHANICAL NANOCOMPUTERS

Perhaps one of the most interesting theories in nanocomputing ,mechanicalnano computers are a revisitation of the babbage machines of the 19th century. The nano versions would not be subject to the large frictional forces that hindered the enormous computing machines designed by Charles Babbage 1830'S and 40'S .These nanocomputers would use nanogears and in the other molecular scale mechanical components.

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Fig: Babbage machine


Fig:mechanical nanocomputer

At present, there are several drawbacks to this type of computing; the first being the actual assembly. All of the current difficulties in assembly nanogears would apply to these mechanical computers. In addition the time required to assemble an entire Babbage machine would be quite long. Each molecule would have to be quite long .Each molecule would have to be "hand quite long" Tunnelling Microscope .Other possibilities in fabrication could involve a form of chemical self-assembly.

QUANTUM NANOCOMPUTERS

In the past several years, quite an interesting has been taken it the possibilities of quantum nanocomputers. In proposed quantum nanocomputers, each bit of information would be represented by a quantum state of one component of the computer, such as the spin of an atom.

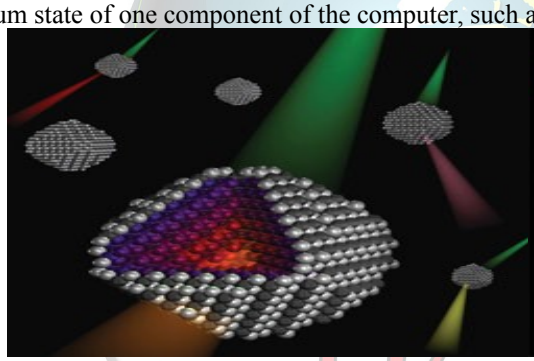
Fig: Quantum crystals

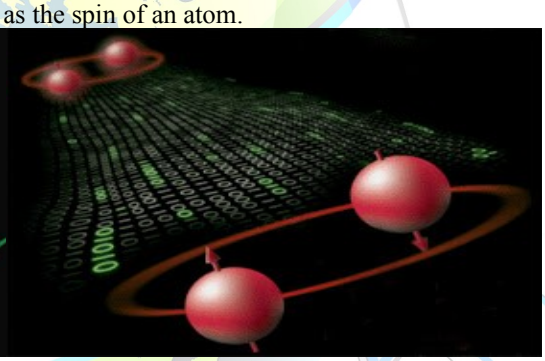
Fig: Quantum entanglement

Is that they would be extremely sensitive to outside interference and a stray photon could throw everything off. They would, therefore, have to be isolated from most external forces and operate at near zero (absolute) temperature. It is possible that a specific architecture ,or design,could compensate for any errors from outside interference ,and currently research is looking into this prospect.Current efforts are concentrating on applying nanocomputers to very large number problems, like those in cryptography, as these computers would be very well suited to the task.

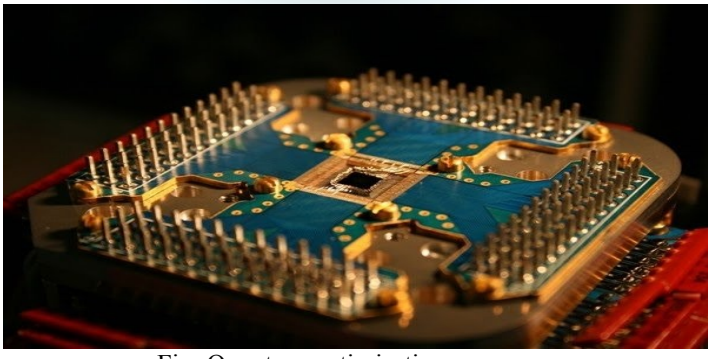
Fig: Quantum optimisation processor

HOW NANOCOMPUTERS WORK?

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Nanocomputers would work by storing data in the form of atomic quantum state or spin (SEM and quantum dot).

There are several methods of nanoelectronic data storage currently being researched. Among the most promising are set electron transistors and quantum dots.

All of these devices function based upon the principles of quantum mechanics.

APPLICATIONS OF NANOCOMPUTING

Nanocomputing systems can succeed in one of many ways. We divide the systems into three categories based on whether they out perform the ITRS metrics primarily in terms of performance, cost or size. Each category will enable different applications. We can roughly define three classes of nanocomputing systems based on their overall performance, cost and size.

1. High performance computing

If nanocomputing reaches the above density levels and maintains the kind of scaling we expect with today's silicon this will enable supercomputing applications of unheralded price or performance. TODO (?) finishes this up high-density inexpensive computing in this scenario we reach a high device density, but the performance may not scale as CMOS scaled. However, due to self assembly these systems will be very inexpensive. This leads to new set applications.

Example: ubiquitous computing

2. High density Inexpensive computing

Ability to meld with real world artifacts at sub-micron scale. In this report we do not address the first class of nanocomputers since this is simply an extension of current scaling laws. Inexpensive high-density computing supports previously in accessible applications on the road towards truly ubiquitous computing. Examples of these applications include intelligent sensors which can be "painted" onto surfaces. Adaptable camouflage, Eye-glasses capable face reorganization. These applications will require of ad hoc networking, powersaving, distributed resource management, fault tolerance at the systems level. Furthermore, programming such systems, with potentially billions of processors, will require new programming models and or machine learning techniques to produce co-ordinated global behaviour from local specification.

3. Micron scale in-situ computing

Nanoelectronical based intelligent sensors provide a unique opportunity to interface with the physical worlds at the submission scale and below. This is particularly true in the case when it is not possible to more the information from the site to or from a remote processor. For example, this will be particularly useful for interacting with biological systems. While progress needs to be in many different areas of nanoscience,nanocomputing will in concert with sensors and actuators, enable interesting applications at this level . The very nature of some of the technologies underlying nanocomputing supportsinteractions at the micron-scale. For example, molecular computing uses the properties of molecules to perform computation. Molecular sensors can be incorporated into molecular circuits increasing the efficiency of signal transduction, possible reducing power requirement and decreasing response time. Body-implantable devices are already available for drug delivery, electrical and other internal medical purposes.

CONCLUSION

Nanotechnology is used in computers for betterment in its efficiency. Creating such kinds of technologies, might be helpful or dangerous to people in our future. Peoples may even be unemployed if the technology may grow more and more.In this paper we have discussed about the nanocomputing and its working which enhances the efficiency of devices by using some nanowires ,nano-cooling techniques in laptops ,mobile phones and many other portable electronic devices. So we finally conclude that this nanotechnology will bring out many more new techniques or technology for the betterment of the future with cleaner, high efficiency, stronger, lighter, less expensive, reliability and smaller size.

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