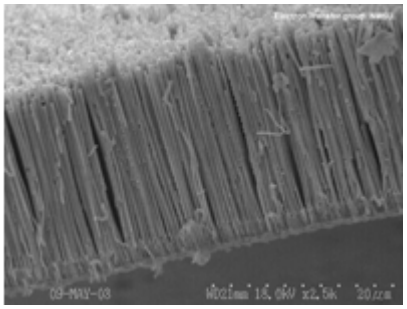
THE FUTURE OF COMPUTER TECHNOLOGY

In the past twenty years, there has been a dramatic increase in the processing speed of computers, network capacity and the speed of the internet. These advances have paved the way for the revolution of fields such as quantum physics, artificial intelligence and nanotechnology. These advances will have a profound effect on the way we live and work, the virtual reality we see in movies like the Matrix, may actually come true in the next decade or so.

NANOCOMPUTERS



Scientists are trying to use nanotechnology to make very tiny chips, electrical conductors and logic gates. Using nanotechnology, chips can be built up one atom at a time and hence there would be no wastage of space, enabling much smaller devices to be built. Using this technology, logic gates will be composed of just a few atoms and electrical conductors (called nanowires) will be merely an atom thick and a data bit will be represented by the presence or absence of an electron.

A component of nanotechnology, nanocomputing will give rise to four types of nanocomputers:

- Electronic nanocomputers
- Chemical and Biochemical nanocomputers
- Mechanical nanocomputers
- Quantum nanocomputers

Electronic nanocomputers

Eletronic nanocomputers are created through microscopic circuits using nanolithography. [Nanocomputers]

Chemical and Biochemical nanocomputers

The interaction between different chemicals and their structures is used to store and process information in chemical nanocomputers. In order to create a chemical nanocomputer, engineers need to be able to control individual atoms and molecules so that these atoms and molecules can be made to perform controllable calculations and data storage tasks.

Mechanical nanocomputers

A mechanical nanocomputer uses tiny mobile components called nanogears to encode

information. Some scientists predict that such mechanical nanocomputers will be used to control nanorobots.

Quantum nanocomputers

A quantum nanocomputer store data in the form of atomic quantum states or spin. Single-electron memory (SEM) and quantum dots are examples of this type of technology.

Humanizing Nanocomputers

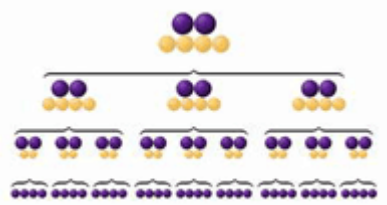
Apart from this, scientists aim to use nanotechnology to create nanorobots that will serve as antibodies that can be programmed. This will help to protect humans against pathogenic bacteria and viruses that keep mutating rendering many remedies ineffective against new strains. Nanorobots would overcome this problem by reprogramming selectively to destroy the new pathogens. Nanorobots are predicted to be part of the future of human medicine.

• SPRAY-ON NANO COMPUTERS

Consider that research is being done at the Ediburgh University to create "spray-on computers the size of a grain of sand" that will transform information technology. The research team aims to achieve this goal within four years.

When these nanocomputers are sprayed on to the chests of coronary patients, the tiny cells record a patient's health and transmit information back to a hospital computer. This would enable doctors to monitor heart patients who are living at home.

QUANTUM COMPUTERS



A quantum computer uses quantum mechanical phenomena, such as entanglement and superposition to process data. Quantum computation aims to use the quantum properties of particles to represent and structure data. Quantum mechanics is used to understand how to perform operations with this data. The quantum mechanical properties of atoms or nuclei allow these particles to work together as quantum bits, or qubits. These qubits work together to form the computer's processor and memory. Qubits can interact with each other while being isolated from the external environment and this enables them to perform certain calculations much faster than conventional computers.

By computing many different numbers simultaneously and then interfering the results to get a single answer, a quantum computer can perform a large number of operations in parallel and ends up being much more powerful than a digital computer of the same size.
"In the tiny spaces inside atoms, the ordinary rules of reality ... no longer hold. Defying all common sense, a single particle can be in two places at the same time. And so, while a switch in a conventional computer can be either on or off, representing 1 or 0, a quantum switch can paradoxically be in both states at the same time, saying 1 and 0.... Therein lies the source of the power." Whereas three ordinary switches could store any one of eight patterns, three quantum switches can hold all eight at once, taking "a shortcut through time." [Scientific America.com]

Quantum computers could prove to be useful for running simulations of quantum mechanics. This would benefit the fields of physics, chemistry, materials science, nanotechnology, biology and medicine because currently, advancement in these fields is limited by the slow speed of quantum mechanical simulations.

Quantum computing is ideal for tasks such as cryptography, modeling and indexing very large databases. Many government and military funding agencies are supporting quantum computing research to develop quantum computers for civilian and national security purposes, such as cryptanalysis.

ARTIFICIAL INTELLIGENCE

The term “Artificial Intelligence” was coined in 1956 by John McCarthy at the Massachusetts Institute of Technology. It is a branch of computer science that aims to make computers behave like humans. [Artificial Intelligence] Artificial Intelligence includes programming computers to make decisions in real life situations (e.g. some of these “expert systems” help physicians in the diagnosis of diseases based on symptoms), programming computers to understand human languages (natural language), programming computers to play games such as chess and checkers (games playing), programming computers to hear, see and react to other sensory stimuli(robotics) and designing systems that mimic human intelligence by attempting to reproduce the types of physical connections between neurones in the human brain (neural networks).

Natural-language processing would allow ordinary people who don’t have any knowledge of programming languages to interact with computers.

So what does the future of computer technology look like after these developments?

Through nanotechnology, computing devices are becoming progressively smaller and more

powerful. Everyday devices with embedded technology and connectivity are becoming a reality. Nanotechnology has led to the creation of increasingly smaller and faster computers that can be embedded into small devices.

This has led to the idea of pervasive computing which aims to integrate software and hardware into all man made and some natural products. It is predicted that almost any items such as clothing, tools, appliances, cars, homes, coffee mugs and the human body will be imbedded with chips that will connect the device to an infinite network of other devices. [Pervasive Computing] Hence, in the future network technologies will be combined with wireless computing, voice recognition, Internet capability and artificial intelligence with an aim to create an environment where the connectivity of devices is embedded in such a way that the connectivity is not inconvenient or outwardly visible and is always available. In this way, computer technology will saturate almost every facet of our life. What seems like virtual reality at the moment will become the human reality in the future of computer technology.

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