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Recent developments in nanotechnology- a way to next generation robots

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Abstract: Nano Tech will make the world as a tiny particle like atom. In future the world will depend on Nanotechnology. This paper presents the man madenano robots using Nanotechnology. They are simply named as Nanobots. Nano technology will make a revolution in the field of robotics. Nanobots can be involved in various works in different fields. Based on their application, the nanobots can act as artificial living beings in future. In this paper, evolution of nanobots, parts of the nanobots, development and their special applications were discussed in detail.

Keywords: Nano Technology, Nanobots, Massive Parallelism Assembly, Nano Batteries, Carbon Nano Arms, Nano Sensors and Nano Motors

Introduction

Nanotechnology is an exciting area of scientific development which promises 'more for less'. It offers ways to create smaller, cheaper, lighter and faster devices that can do more and cleverer things. Nanotechnology is the engineering of functional systems at the molecular scale. Nanotechnology refers to the projected ability to construct items from the bottom up, using techniques and tools being

developed today to make complete, high performance products. There are many examples of the application of nanotechnology from simple to complex. New-generation hip implants can be made more 'body friendly' because they have a nanoscale topography that encourages acceptance by the cells in their vicinity. Moving on to more complex products, a good example of the application of nanotechnology is a mobile phone, which has changed dramatically in a few years becoming smaller and smaller, growing cleverer and faster and cheaper?

Nanotechnology

Nano originates from the Greek word meaning "dwarf". A nanometre is one billionth of a metre, which is tiny, only the length of ten hydrogen atoms, or about one hundred thousandth of the width of a hair. In simple terms, nanotechnology can be defined as 'engineering at a very small scale'. Nanotechnology, in one sense, is the natural continuation of the miniaturization revolution that we have witnessed over the last decade. Like Automotive and aerospace industries enabling the construction of higher quality and safer vehicles and planes. Because of its potential, nanotechnology is of global interest.

Nano Robots - Nanobots

Basic nanomachines are already in use. Nanobots will be the next generation of nanomachines. Advanced nanobots will be able to sense and adapt to environmental stimuli such as heat, light, sounds, surface textures, and chemicals; perform complex calculations; move, communicate, and work together and to some extent, repair or even replicate themselves.

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Massive parallelism assembly (MPA)

Nanotechnology is the science and application of creating objects on a level smaller than 100 nanometers. The extreme concept of nanotechnology is the "bottom up" creation of virtually any material or object by assembling one atom at a time. Although nanotech processes occur at the scale of nanometers, the materials and objects that result from these processes can be much larger. Large-scale results happen when nanotechnology involves massive parallelism in which many simultaneous and synergistic nanoscale processes combine to produce a large-scale result.

Nanomanufacturing is the creation of materials and products through nano disciplines. It involves (1) Direct Molecular Assembly (DMA)-Making discrete, directed assembly of individual atoms and molecules into macroscale materials and products; (2) Indirect Crystalline Assembly (ICA)-creation of conditions that foster the growth of nanoscale crystals that are then combined into macroscale materials and products; or (3) Massive Parallelism Assembly (MPA)-the creation of many nanomachines or nanobots whose operating parameters cause them to work synergistically to assemble atoms and molecules into macroscale materials and products.

Electronic circuitry in nanobots

Nanocrystalline processes can also be used to grow electronics components. For example: (1) carbon nanotubes grown in targeted micro-environments can have super-conductive properties and (2) nanowires as small as strings of atoms can be grown like crystals and then assembled into circuits. Circuits created atom-by-atom or grown using nanocrystalline techniques will be much smaller, lighter, efficient, cooler, stronger, and faster than circuits made with conventional manufacturing processes. BY this the nano circuitry for the functioning of Nanobots can made in an efficient way.

Power supply for nanobots

Nanophotonics is the application of nanotechnology to the transformation of electricity to light or light to electricity. In this area, nanocrystals or nanophosphores can make this transformation with greater efficiency than traditional incandescent lighting or solar panels. Using nanoceramic material as the covering for batteries absorbs electromagnetic waves and prolongs battery life. Nanopolymers provide high-performance insulation for energy transmission lines and decrease energy loss across long distances. Silicon nanoparticles enhance performance of solar cells. Placing a film of silicon nanoparticles onto a silicon solar cell can boost power, reduce heat and prolong the cell's life. Integrating a high-quality film of silicon nanoparticles 1 nanometer in size directly onto silicon solar cells improves power performance by 60 percent in the ultraviolet range of the spectrum. This will play a vital role in the preparation of power supply unit to nanobots. Nanotechnology is being used to reduce the cost of catalysts used in fuel cells to produce hydrogen ions from fuel such as methanol and to improve the efficiency of membranes used in fuel cells to separate hydrogen ions from other gases such as oxygen. Nano battery will be a good as new after sitting on the shelf for decades. Another battery can be recharged significantly faster than conventional batteries. The nanoengineered battery is lightweight, ultra thin, completely flexible, and geared toward meeting the trickiest design and energy requirements of

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tomorrow's gadgets, implantable medical equipment, and transportation vehicles.

Silicon nanowires to store data in nanobots

Fabricated a memory device which combined with silicon nanowires can be used for data-storage. Their hybrid structure may be more reliable than other nanowire-based memory devices recently built and more easily integrated into commercial applications.

Nanotube adhesive sticks-foot for nanobots

Mimicking the agile gecko, with its uncanny ability to run up walls and across ceilings, has long been a goal of materials scientists. Researchers have taken one sticky step in the right direction; creating synthetic "gecko tape" with four times the sticking power of the real thing. Researchers describe a process for making polymer surfaces covered with carbon nanotube hairs. The nanotubes imitate the thousands of microscopic hairs on a gecko's footpad, which form weak bonds with whatever surface the creature touches, allowing it to "unstick" it simply by shifting its foot.

Controlling nanobots remotely

By shining ultraviolet laser light on tiny molecules of azobenzene adhered on a layer of gold, they could force the molecules to change shape at will. Potentially, the molecules could be incorporated into nanomachines in the form of remotely controlled switches, pistons or other movable components. An idea conceived by one of the world's greatest scientists nearly 150 years ago has finally been realised with a tiny machine that could eventually lead to lasers moving objects remotely.

Motors for nanobots

A robotics system that is going to interact with its environment needs to be able to move around within that environment as well as move parts of its environment. This is accomplished through the use of three motors. They are larger but more easily attached and include a rotation sensor.

Sensors for nanobots

A nano light sensor (capable of sensing shades of grey, not true color) and a nano sound sensor that can detect the amplitude of a sound (loudness, but not detail) as well as a touch sensor (a simple pressure switch) and ultrasonic sensor can be used in nano

Chemical sensors for nanobots

Nanotechnology can enable sensors to detect very small amounts of chemical vapors. Various types of detecting elements, such as carbon nanotubes, zinc oxide nanowires or palladium nanoparticles can be used in nanotechnology-based sensors. Because of the small size of nanotubes, nanowires, or nanoparticles, a few gas molecules are sufficient to change the electrical properties of the sensing elements. This allows the detection of a very low concentration of chemical vapors.

Nano-"building blocks" to take on new shapes

Researchers have **Figure:**d out how to train synthetic polymer molecules to behave–to literally "self-assemble" –and form into long, multicompartment cylinders 1,000 times thinner than a human hair, with potential uses in radiology, signal communication and the delivery of therapeutic drugs in the human body. The discovery, a fundamental new tool for

nanotechnology, is reported in the Aug. 3 issue of the prestigious journal 'Science.'

Carbon nanotubes endure heavy wear and tear- a boon for nanobots

The ability of carbon nanotubes to withstand repeated stress yet retain their structural and mechanical integrity is similar to the behavior of soft tissue. When paired with the strong electrical conductivity of carbon nanotubes, this ability to endure wear and tear, or fatigue, suggests the materials could be used to create structures that mimic artificial muscles or interesting electro-mechanical systems. Researchers have developed a new method of compacting carbon nanotubes into dense bundles. These tightly packed bundles are efficient conductors and could one day replace copper as the primary interconnects used on computer chips and even hasten the transition to next-generation 3-D stacked chips. Making composite fabric with nano-sized particles or fibers allows improvement of fabric properties without a significant increase in weight, thickness, or stiffness as might have

Nanotechnology machines- a match for biomotors

While the concept of a 'machine' can be extended to the nano-world, these nanomachinescan not be built by just further miniaturizing machine blueprints from the macro-world. On the nanoscale, the nanomachine components would be atomic or molecular structures each designed to perform a specific task which, all taken together, would result in a complex function. The problem is that functional nanomachinery will need to take into account the quantum effects that dominate the behavior of matter at the nanoscale, affecting the optical, electrical and magnetic behavior of materials.

Nanobots in environment

Nanotechnology has the potential to have a positive effect on the environment. For instance, we can program airborne nanorobots to rebuild the thinning ozone layer. Nanorobots could remove contaminants from water sources and clean up oil spills. Manufacturing materials using the bottom-upmethod of nanotechnology also creates less pollution than conventional manufacturing processes. Our dependence on non-renewable resources would diminish with nanotechnology.

Nanomedibots – (nanobots in medicine)

Nanotechnology may have its biggest impact on the medical industry. Patients will drink fluids containing nanorobots programmed to attack and reconstruct the molecular structure of cancer cells and viruses. There's even speculation that nanorobots could slow or reverse the aging process, and life expectancy could increase significantly. Nanorobots could also be programmed to perform delicate surgeries such nanosurgeons could work at a level a thousand times more precise than the sharpest scalpel. By working on such a small scale, a nanorobot could operate without leaving the scars that conventional surgery does. Additionally, nanorobots could change your physical appearance. They could be programmed to perform cosmetic surgery, rearranging your atoms to change your ears, nose, eye color or any other physical feature you wish to alter.

In addition to delivering pharmaceuticals as discussed above, nanotech medical robots-nanomedibots may be able to monitor body function, repair damaged tissue at the

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molecular level, deconstruct pathologic or abnormal material or cells such as cancer or plaque; and enhance human health and functioning. Although nanomedibots have not been developed, there are ongoing advances in nano fluids and carbon nanotube flow sensors that may become their building blocks. As nanotechnology and biotechnology advance, nanomedibots and engineered beneficial microorganisms may be integrated. In the future these nanorobots could actually be programmed to repair specific diseased cells, functioning in a similiar way to antibodies in our natural healing processes.

Nanomaterials involved in the preparation of nanobots

1. Pallidium nanoparticles used in sensors
2. Carbon nanotubes used to strengthen robot arms
3. Silicate nanoparticles used to provide a barrier to gasses and moisture
4. Titanium oxide nanoparticles used as a photocatalyst to be used in nanobots.
5. Manganese oxide nanoparticles used as a catalyst for removal of volatile organic compounds.
6. Zinc oxide nano-wires used as detection elements in sensors of nanobots.

Latest nanoparticle applications under development

1. Pallidium nanoparticles used in chemical vapor sensors
2. Carbon nanotubes used to strengthen robotic arms
3. Quantum Dots (crystalline nanoparticles) that identify the location of various things.
4. Carbon nanotubes used in broken bones to provide a structure for new bone material to grow.
5. Carbon nanotubes used to direct electrons to illuminate pixels, resulting in a lightweight, millimeter thick "nanoemmissive" display panel.
6. Iron nanoparticles used to clean up carbon tetrachloride pollution in ground water
7. Silicate nanoparticles used to provide a barrier to gasses, or moisture in a plastic film used for packaging. This could reduce the possibly of spoiling or drying out the outer layer.
8. Zinc oxide nanoparticles dispersed in industrial coatings to protect wood, plastic and textiles from exposure to UV rays.
9. Silicon dioxide crystalline nanoparticles filling gaps between carbon fibers strengthen tennis racquets.
10. Silver nanoparticles in fabric that kills bacteria making clothing odor-resistant.
11. Titanium oxide nanoparticles used as a photocatalyst to remove germs and other pollutants from air

Conclusion

Growth of technology is growth of nation. Nano technology is the suitable technology for that. Future mainly will depend on the technology of nano. It may be called as “the king of technologies”. Nano applications are underway in the areas of medical diagnosis and treatments, biotechnology, advanced development of pharmaceuticals, cosmetics, aerospace and automotive industries, security, defense, and environmental protection, electronics, computers and communication, energy production, storage, and lighting, and manufacturing and product

design. Nanomedibots may repair vital tissue damanged by injury or disease, or destroy cancerous tissue that has gone awry, without invasive surgery.

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