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Nanorobots: Application in Data Mining

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Abstract:- *Nanorobot is a tiny machine designed to perform a specific task or tasks repeatedly and with precision at Nanoscale dimensions , that is dimensions for a few nanometres(1nm= 10^{-9}m).This paper begins with a brief introduction to the field of Nanorobotics and Nanorobots synthesis, applications in various fields and disadvantages. The main objective of this paper is describing a platform suitable for the design and manufacturing research using Nanorobots for information processing in the process of Extracting information from a dataset and transform it into an understandable structure for furtheruse i.e. Data Mining.*

Keywords: Nanorobots, Nanoscale, Synthesis, Applications, Information processing, Data Mining.

Introduction:

Nanotechnology can be best be defined as a description of activities at the level of atoms and molecules that have applications in the real world. A Nanometre is a billionth of a meter, that is, about 1/80,000 of the diameter of a human hair, or 10 times the diameter of a hydrogen atom(1)The field of Nanorobotics studies the design , manufacturing, programming and control of the Nanoscale robots.(2). In 1887, James Clerk Maxwell first mentioned concept of nanorobotics distinguishing in nanotechnology. The first observation and size measurement of nanoparticle were made by Richard Feyman in 1959(3). The term nanotechnology was coined by a student in Tokyo science university in1974(4) the main element used in Nanorobots is carbon because of its inertness and strength in the form of diamond and fullerene. Nanorobots have exterior passive diamond coating especially to avoid attack by the host immune system. (5). They might function at atomic (or) molecular level to build devices, machines or circuits, a process known as **molecular manufacturing**. The might also produce copies of themselves to replace worn-out units, a process called **self-replication**. A major advantage of nanorobot is durability. In theory, they can remain operational for years, decades or centuries. Due its tiny size, it allows mechanical and electrical events to occur in less time at a given speed. (6).nanobots would constitute any 'smart' structure capable of actuation, sensing, signalling, Information processing, Intelligence, manipulation and swarm behaviour at nanocale(10^{-9}).(7) The field of medicine is expected to receive the largest improvement from this Nanotechnology this is because nanotechnology provides the advantage of transporting large amounts of nanorobots in a single injection. Furthermore, designs that include a communication interface will allow adaption to the programming and function of nanorobots already in the body. This will improve disease monitoring and treatment whilst reducing the need for invasive procedures. Though currently hypothetical, nanorobots will advance many fields through the manipulation of nano-sized objects. These nanobots are mainly used in the field of medicine known as **Nanomedicine.**

Structure and design of Nanorobots:

Components of Nanorobots

The main components of nanorobots are carbon because its inert and possesses hard and good strength and in the form of adiamond. The other components are hydrogen, oxygen, nitrogen, sulphur, silicon and fluorine etc which are used on nanoscale.

Parts of Nanorobots

Medicine cavity:

It is a hollow section inside the Nanorobot used to hold small doses of medicine. This robot is capable of releasing medication directly to the site of injury or infection. Nanorbots could also carry the chemicals used in chemotherapy to treat cancer.

Probes, knives and chisels:

To remove and blockage these probes, knives, and chisels are used. These parts help nanorobot to grab and breakdown the material. Also they might need a device to crush clots into very small pieces. If a partial clot breaks free and enters the blood stream, it may cause more problems further down the circulatory system.(8)

Microwave emitters and ultrasonic signal Generators:

Doctors need a method for destroying cancerous cells without rupturing it. By using fin tuned microwaves or ultrasonic signals a nanorobot could break the chemical bond in the cancerous cell, killing it without breaking cell wall. Alternatively, the robot could emit microwaves or ultrasonic signals in order to heat the cancerous cell enough to destroy it.

Electrodes:

With the help of electrodes nanorobots generate electric current, heating the cell until it dies.

Lasers:

Power laser may burn the harmful materials like cancerous cells, blood clots and plaques. These lasers vaporise tissues. With the help of powerful laser vaporising cancerous cells is the challenging work, but this laser does not harm to surrounding tissues. Team around the whole world is working now a day, to develop medical nanorobots that are small and enter in to blood stream. (8)

Power supply for nanorobots:

Both externally and internally nanorobots get power. Nanorobots get power directly from blood stream, for creating power nanorobots use patients body heat. These work just like navigation system(9).

Different types of nanorobots:

There are different types of Nanorobots

Small engine ever created: like any other engine , it converts heat energy into movement- but it does so on a smaller scale than ever seen before. The atom is trapped in a cone of electromagnetic energy and lasers are used to heat it up and cool it down, which causes the atom to move back and forth in the cone like an engine piston.

Bacteria Powered robots: In this method electric fields are used to help microscopic bacteria-powered robots detect obstacles in their environment and navigate around them. Uses include delivering medications, manipulating stem cells to direct their growth or building a microstructure.

Sperm-inspired microrobots: these can be controlled by oscillating weak magnetic fields. They will be used in complex micro-manipulation and targeted therapy tasks.

Nanorockets: Remote controlled nanoscale version of a rocket by combining nanoparticles with biological molecules. The researchers hope to develop the rocket so it can be used in any environment

Nanoswimmers: ETH Zurich and Technion researchers have developed an elastic"nanoswimmer" polypyrrole(ppy)nanowire about 15 micrometers(millionth of a meter)long and 200 nanometres thick that can move through biological fluid environments at almost 15 micrometers per second. The nanoswimmers cold be functionalized to deliver drugs and magnetically controlled to swim through the bloodstream to target cancer cells.(10)

Biochip: the joint use of nanoelectronics, photolithography, and new biomaterials, can be considered as a possible way to enable the required manufacturing technology towards nanorobots for common medical applications, such as surgical instrumentation, diagnosis and rug delivery. So, practicalnanorobot should be integrated as nanoelectronics device, which will allow tele-operation and advanced capabilities for medical instrumentation.(11)

Nubots: nubot is an abbreviation for "nucleic acid robots". Nubots are synthetic robotics devices at the nanoscale. Representative nubots include the several DNA walkers reported by Andrew Tuber fields group at the university of oxford.

Bacteria based: This approach proposes the use of biological micro organisms, like Escherichia coli bacteria. Hence, the model uses a flagellum for propulsion purposes. The use of electromagnetic fields normally applied to control the motion of this kind of biological integrated device, although it limited applications.(12)

Applications of Nanorobots:

Data Mining: It is an interdisciplinary subfield of computer science. It is a process to extract information from a data set and transform it into an understandable structure for further use. This dataminng is mostly applied in sales/ marketing, banking/Finance, healthcare insurance, Transportation and medicine.Nanorobotas would constitute a structure capable of information processing at nanoscale. On these nanorobots using integrated sensors for data transfer is the better way to read and write data. An electromagnetic reader is applied to launch waves and detect the current status of nanorobots. The nanorobots monitoring data converts the wave propagation generated by the emitting device through a well defined protocol. According with last set of event recorded in pattern arrays, information can be reflected back by waves resonance. For nanorobot passive data transferring ~4.5k Hz frequency with approximate 22us delays are possible ranges for data communication.

In Cryostatis: the extraordinary medical prospects ahead of us renewed interest in a proposal made long ago: that the dying patient could be frozen, then stored at the temperature of liquid nitrogen for decades or even centuries until the necessary medical technology to restrore health is developed called cryonics, this service is now available from several companies. Because final proof that will work must wait until after we have developed a medical technology, based on a foundation of a mature nanotechnology, the procedure is experimental. We cannot prove today that medical technology will be able to reverse freezing injury 100 years from now. But given the wonderful advances that we see coming, it seems likely we should be able to

reverse freezing injury-especially when that injury is minimized by the rapid introduction through the vascular system of cryoprotectants and other chemicals to cushion the tissues against further injury.(13)

NanoImpression: Impression material is available with nanotechnology application. Nanofiller are integrated in the vinylplysiloxanes, producing a unique addition siloxane impression material. The main advantage of material is it has better flow, improved hydrophilic properties hence fewer voids at margin and better model pouring, enhanced detail precision.(14)

In Surgery: Surgicalnanorobots could be introduced into the body through he vascular system or at the ends of catheters into various vessels and other cavities in the human body. A surgical nanorobot, programmed or guided by a human surgeon, could act a semi-autonomous on-site surgeon inside the human body.(15)

In Haematology: This ranges from developing artificial methods of transporting oxygen in the body after major trauma to forming improved clotting capabilities in the event of a dangerous haemorrhage. Respirocytes and clottocytes are artificial RBC and platelets for transport of respiratory gas and halting bleeds respectively.

In Treatment of Diabetes: it is important to maintain glucose level in the body for these nanorobots are helpful. The SGLT3 (human sodium glucose co-transporter type 3) has influence in regulating extracellular glucose concentration and define glucose level in the body and acts as sensor or identify glucose.(16) nanorobots use chemo sensor that involve the modulation of SGLT3 glucosensor activity. With the help of this chemosensor nanorobots effectively determine of insulin or other treatments.(5)

Nanorobots in kidney stones: Nanorobots are used to break the kidney stones with the help of ultrasonic shocks. Kidney stones are painful and alarge stone does not passout in urine. Sometimes doctor break this stones by ultrasonic frequency but these are not effective in always. Nanorobots break up these kidney stones by using small laser and these smaller pieces are passing out in urine outside the body.(17)

Nanorobotsin Cancer Treatment: cancer treatment comes to effectiveness if it is detected in early step of cancer. Before the metastasis began cancer should be detected nanorobots with chemical sensors are used for detecting the tumour cells in early stage of cancer development.(18). This nanosensor will sense the presence of malignant cells in the body. Nano-carriers used to carry out nanosensor and encapsulated drug to a particular area of cancerous tissues. These encapsulated drugs are delivered by to a nanorobots particulate site(19, 20)

Disadvantages:

- Initial design high in cost.
- Design is complicated one
- Hard to interface, customise
- Privacy issues
- Security issues
- Misuse of information

Conclusion:

In this paper, we have attempted to describe about what are nanorobots and their types, application in various field. Till now we have known Nanorobots are a boon for medialfield .to an extend we like to apply it in information technology . Thus how data mining can be simplified and reduce the risk by application of nanorobots, du eto its high durability, signalling, sensing and information processing structure.

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