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A Review ON Nanorobots

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ABSTRACT

The nanorobotics is the technology of the creating machines or the robots at or close to a scale of the 10-9metres[nanometre] nanorobots. The nanobots or nanoids[nanorobots] are constructed of the nanoscale or the molecular components. At this time, as no artificial non-biological nanorobots have been created so far, they remain the hypothetical concept. This articles focuses on history of nanorobots, composition of nanorobots, mechanism of nanorobots & applications of nanorobots.

Keywords: Nanorobots, Mechanism, Applications

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INTRODUCTION

The nanotechnology is a creation of the fully mechanical machine with its physical or its size of components is very close to the nanometre range. This kind is commonly known as the nanorobotics. The robotics are used generally in different fields like the transportation, medicine, army, commerce and communication. Due to the limited nanoscale & integration capabilities of the available power sources, control and computation schemes and tools, communication & coarse to fine motion mechanisms, manipulators, sensors & actuators, currently the robots sizes have from tens of the centimeters down to the millimeters. The nanorobot is the computer-controlled robotic device which is constructed of the nanoscale components to the molecular precision & is microscopic in the size. To the creation of the new mechanisms & human protective devices, we can use this technology. The robotics is a branch of the technology that deals with a design, construction, operation & application of the robots. In this technology the computer systems for their control, sensory feedback & processing of information. Now a days the robotics is the rapidly growing field a nano technological advances & continues the research, design & creating the new robots for various practical purposes whether militarily or domestically. The nanorobotics is the technology of the creating machines or the robots at or close to a scale of the 10-9metres [nanometre] nanorobots. The nanobots or nanoids[nanorobots] are constructed of the nanoscale or the molecular components. At this time, as no artificial non-biological nanorobots have been created so far, they remain the hypothetical concept.[1-4]

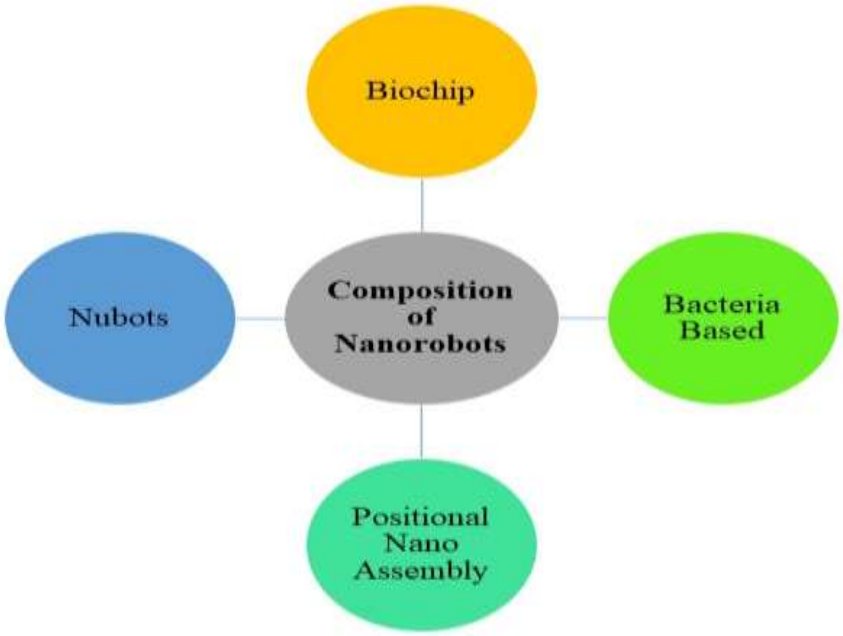
HISTORY OF NANOROBOTS

- In 29 December 1959: The Richard Feynman gives a famous “There’s Plenty of Room at the Bottom” talk.
- The first use of the nanotechnology concepts, describes an individual atoms & molecules could be manipulated.
- In 1974: The Norio Taniguchi a Professor defines nanotechnology as “the processing of the separation, consolidation & deformation of the materials by the molecule/ atom.”
- In 1980’s:The Dr. Eric Drexler publishes several scientific articles promoting the nanoscale phenomena & devices.
- In 1980’s: The Nobel Prize laureate Richard Smalley. Smalley has extended his vision to the carbon nanotubes discovered by the Sumio Iijima, which he envisions as a next super interconnection for the ultra small electronics. The term nanotechnology has evolved to

mean a manipulation of a elements to create the unique & hopefully structures that are useful.

- In 1986: Dr. Eric Drexler is published the book Engines of Creation: The Coming Era of the nanotechnology. He envisioned the nanorobots as self replicating. The first book on the nanotechnology.[5-6]

COMPOSITION OF NANOROBOTS



A] Biochip

The Synthesis involves the joint use of the photolithography, nano electronics & the new biomaterials. For the manufacturing of the nano robots for the common medical applications such as for drug delivery ,surgical instrumentation & diagnosis, it can be used. The electronics industries currently use the biochips for manufacturing. The nano robots with the biochips can be integrated in the nano electronics devices which will allow the tele-operation & the advanced capabilities for the medical instrumentation.

B] Bacteria Based

These approaches uses the biological microorganisms like the Escherichia coli bacteria. The model uses the flagellum for the propulsion purposes. To control the motion of this kind of the biological integrated device the use of the electromagnetic fields is normally applied.

C] Positional Nano Assembly

The Robert Freitas & Ralph Merkle in 2000 are developing the practical research agenda which is specifically aimed at the developing positional-controlled the diamond mechanic synthesis & the diamonded Nano factory that would be capable of the building diamonded medical nano robots.

D] Nubots

The nubot is an abbreviation for the "nucleic acid robots. " The nubots are the synthetic robotics devices at the nanoscale. The representative nubots include the several DNA walkers reported by the Ned Seaman's group at the NYU, Niles Pierce's group at the Caltech, John Reif's group at the Duke University, Chengde Mao's group at the Purdue & the Andrew Turberfield's group at the University of Oxford.[7-9]

MECHANISM OF NANOROBOTS

To provide the new medical devices for doctors, the research & development of the nano robots with the embedded nano biosensors & actuators is considered as the new possibility. To the effectively advance new medical technologies, the controls are sought. The development of the microelectronics in the 1980's has led to the new tools for the biomedical instrumentation. Further the miniaturization towards the integrated medical systems providing the efficient methodologies for the pathological prognosis can be designed.[10-16] The use of the micro devices in medical treatments & surgery is the reality which has brought the many improvements in the clinical procedures in the recent years. For the intracranial & heart surgery the catheterization has been used successfully as the important methodology. Now the advent of the bimolecular science & new manufacturing techniques is helping us to advance a miniaturization of the devices from the micro to the nano electronics. The biomedical sensors are being operated by a latest technology which forms a basis for the designing bimolecular actuators.[17-23] The 1st series of the nanotechnology prototypes for the molecular machines are being investigated in the different ways along with the some devices for the propulsion & sensing are also being studied by the some workers.[24-29]

APPLICATIONS OF NANOROBOTS

1] Nanorobots In The Diagnosis And Treatment Of Diabetes

2] Nanorobots In Gene Therapy

3] Nanorobots In Cancer Detection And Treatment

4] Nanorobots In Surgery

1] Nanorobots in the diagnosis and treatment of diabetes

The glucose which is carried through the blood stream is important to maintain a human metabolism working healthfully & it's correct level is the key issue in the diagnosis & treatment of the diabetes. The protein hSGLT3 has the important influence in maintaining the proper

GI[Gastrointestinal] cholinergic nerve & skeletal muscle function activities regulating the extracellular glucose concentration which is Intrinsically related to the glucose molecules. The hSGLT3 molecule can serve to define the glucose levels for the diabetes patients. The most interesting aspect of this protein is that the fact that it serves as the sensor for identification of glucose. A simulated nanorobot prototype model has embedded CMOS [Complementary Metal Oxide Semiconductor] nanobioelectronics. It features the size of the ~2 micronmeter which permits it to freely operate inside the body. Whether a nanorobot is visible or invisible for the immune reactions, for the detecting glucose levels in the blood stream it has no interference. Even with the immune system reaction inside a body the nanorobot is not attacked by a white blood cells due to biocompatibility. The nanorobot uses the embedded chemosensor for the glucose monitoring, that involves the modulation of the hSGLT3 protein glucosensor activity. The nanorobot can thus effectively determine through its onboard chemical sensor, if a patient needs to inject the insulin or to take any further action such as any medication which is clinically prescribed. The image of a NCD simulator workspace shows a inside view of the venule blood vessel with the grid texture, RBCs [red blood cells] & nanorobots. They flow with the RBCs through a bloodstream detecting the level of glucose. The nanorobots try to keep the level of glucose ranging around 130 mg/dl as the target for the BGLs [Blood Glucose Levels], at the typical glucose concentration,. As the displacement range the variation of the 30mg/dl can be adopted though this can be changed based on the medical prescriptions. In medical nanorobot architecture, the significant measured data can be then automatically transferred through the RF signals to a mobile phone carried by the patient. If the glucose achieves critical levels at any time the nanorobot emits an alarm through the mobile phone.

2] Nanorobots in gene therapy

By comparing the molecular structures of both DNA & proteins found in the cell to the known or the desired reference structures the medical nano robots can readily treat the genetic diseases. In some of the cases the chromosomal replacement therapy is more efficient than in CY to repair. The floating inside a nucleus of the human cell, an assembler built repair vessel performs some of genetic maintenance. The stretching the super coil of the DNA between its lower pair of the robot arms, the nano machine gently pulls a unwound strand through the opening in its prow for the analysis. Meanwhile the upper arms detach the regulatory proteins from the chain & place them in the intake port. The molecular structures of both the DNA & proteins are compared to the information which is stored in a database of the larger nano computer which is positioned outside the nucleus & is connected to a cell-repair ship by the communications link. The Irregularities

found in either structure are then corrected & the proteins reattached to the chain of DNA which re-coils into its original form with the diameter of the only 50 nanometers a repair vessel would be smaller than the most of the viruses & bacteria yet it is capable of the therapies & cures well be beyond the reach of the present-day physicians. The Internal medicine would take on the new significance. The disease would be attacked at a molecular level & such maladies as the viral infections , arteriosclerosis & cancer could be wiped out. Most of the human diseases involve the molecular malfunction at a cellular level & cell function is controlled largely by the gene expression & its resulting protein synthesis. One of the common practice of the genetic therapy which has enjoyed only limited success is to supplement the existing genetic material by inserting the new genetic material into a cell nucleus commonly using the viral bacteriophage bacterial system cell plasmid/phospholipid microbubble cationic liposome, the dendrimeric, chemical, the nanoparticulate or the other appropriate transfer vectors to breach the cell membrane. The permanent replacement of gene by using the viral carriers has failed largely thus far in the human patients due to the immune responses to the antigens of a viral carrier as well as the inflammatory responses, transient effectiveness & insertional mutagenesis. The repeat gene clusters, excess gene copies & partial trisomies & higher polysomies can cause often the significant pathologies, sometimes by mimicking the aging . The attempting to the correct excessive expression caused by these errors by implementing the antisense transcription silencing on the whole-body, the multigene or the whole-chromosome basis would be far less desirable than the developing more effective methods that are therapeutic & that did not require such extensive remediation.

3] Nanorobots in cancer detection and treatment

With the current stages of the medical technologies & the therapy tools the cancer can be treated successfully . Hence, the decisive factor to determine a chance for the patient with the cancer to survive is, how early it was diagnosed, what means, if possible the cancer should be detected at least before the stage of metastasis has began. The other important aspect to achieve the successful treatment for the patients is the development of the efficient TDD [targeted drug delivery] to minimise the side effects from the chemotherapy. By considering the properties of the nanorobots to navigate as the bloodborne devices they can help on such an extremely important aspects of the therapy of cancer. The nanorobots with the embedded chemical biosensors can also be used to perform the detection of the tumor cells in the early stages of the development inside a patient's body. For such a task in order to find the intensity of the E-cadherin signals, the Integrated nanosensors can be utilized. For the application of the nanorobots for the therapy of cancer, a

hardware architecture based on the nanobioelectronics is described. The analyses & conclusions for the proposed model is obtained through the real time 3D simulation.

4] Nanorobots in surgery

Through the vascular system or at the ends of the catheters into various vessels or in other cavities in the human body, the surgical nanorobots could be introduced into the body. The surgical nanorobot is programmed or guided by the human surgeon could act as the semiautonomous on-site surgeon inside a body of human. Such type of device could perform the various functions such as the searching for the pathology & then diagnosing & correcting the lesions by the nanomanipulation coordinated by the on-board computer while maintaining the contact with a supervising surgeon via the ultrasound signals which is coded. The earliest forms of the cellular nanosurgery are already being explored nowadays. For e.g. A micropipette with a <1 micron tip diameter & this micropipette is rapidly vibrating [100 Hz] has been used to completely cut the dendrites from the single neurons without damaging the cell viability. The axotomy of the roundworm neurons was performed by the femtosecond laser surgery. After the surgery the axons functionally regenerated. By vaporizing the tissue locally & while leaving the adjacent tissue unharmed. The femto laser acts like the pair of the nano-scissors.[30]

CONCLUSION

Nanotechnology as an emerging tool in the medicinal applications especially for the diabetes, arteriosclerosis, dentistry, cancer & gene therapy showed how actual developments in the new manufacturing technologies are enabling the innovative works which may help in the constructing & employing the nanorobots most effectively for the biomedical problems. Now a days the robotics is the rapidly growing field a nano technological advances & continues the research, design & creating the new robots for various practical purposes whether militarily or domestically. Using nanorobots for targeted drug delivery would be very beneficial in future. Nano medicine holds the promise to lead to an earlier diagnosis, better therapy and improved follow up care, making the health care more effective and affordable.

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