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Commentary

Micro-Nano Robotics and Manipulation Technologies

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DESCRIPTION

Human beings are made up of tens of trillions of cells and have a highly complex system. Even though the cell is a micro-nano scale complex system, it is difficult to fully comprehend its biological mechanisms, such as the protein-protein interaction, neurotransmission, and apoptosis. In general, the Large-Scale System (LSS) should be defined by the scale of complexity of the system rather than its size. As a result, analyzing biological cells is a critical and difficult task for LSS in order to disclose such a complex system at micro-nano scale sizes [1]. As an advanced research field and promising technology, micro-nano robots and automation systems have gotten a lot more attention. The scale effect is a well-known micro-nanoscale phenomenon that results from interactions at extremely small scales. Through robotics and automation technologies, it is necessary to comprehend and regulate the unique phenomena in the micro-nano scale. Micro-nano robots and automation systems have been developed and explored in a variety of fields, including biological science, medical science, life science, mechatronics, material science, environmental/energy problems, and so on [2].

Green and life innovations based on Micro-Nano robotic Manipulation Technologies

Green and living innovations, in fact, interact with one another to encourage their inventive manifestation. From this perspective, micro-nano robots and automation systems are critical technologies for solving issues and promoting innovation. Currently, we use a variety of micro-Nano-based devices in our daily lives. These devices are being researched using micro and nano mechatronics technologies in order to achieve high efficiency, high integration, high functionality, low energy consumption, low cost, and tiny [3].

Micro-nano robotic manipulation

Nano manipulation can be used for scientific research into mesoscopic phenomena as well as the development of prototype Nano devices. It is a critical technology for determining the properties of nanomaterial, structures, and processes, fabricating Nano building blocks, and assembling Nano devices.

Nanoelectromechanical Systems (NEMS) are projected to enable highly integrated, miniaturized, and multi-functional devices for a wide range of applications. One of the most effective approaches to achieve such great precision is to use bottom-up manufactured nanostructures directly. Nano manipulation techniques are one of the most promising approaches to developing Nano bio-applications on a single cell level for drug delivery, Nano therapy, Nano surgery, and other applications. Biological cells, on the other hand, are often several tens of microns in size. As a result, micromanipulation techniques are effective tools for identifying and manipulating single-cell features [4].

CONCLUSION

Robotics and automation systems on a micro-Nano scale have received a lot more attention as a promising research subject. Through robotics and automation technologies, it is necessary to comprehend and regulate the unique phenomena in the micro-Nano scale. This kind of technology focus on biological applications based on micro-Nano robotic manipulation techniques, known as single cell analysis. Future green and living advancements are predicted to use these strategies. The semi-closed microchip is designed to allow probe type manipulation within the microchip and is used to harvest target cells. As a result, micromanipulation techniques are effective tools for identifying and manipulating single-cell features. Robotics and automation systems on a micro-nano scale have received a lot more attention as a promising research subject. Through robotics and automation technologies, it is necessary to comprehend and regulate the unique phenomena in the micro-nano scale. In this study, we focus on biological applications based on micro-nano robotic manipulation techniques, known as single cell analysis. Future green and living advancements are predicted to use these strategies.

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