CMOS-based Nanorobot to Combat Cancer

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Keywords: biomedical flows, cancer, CMOS, control system, E-cadherin signal, endothelial cell, medical nanorobotics, mobile nanorobot, mobile phones, nanoelectronics, nanomanufacturing design, nanomechatronics, nanomedicine, nanorobot architecture, nanotechnology, nanotubes, nanowires, photonics, RFID, remote inductive powering, SoC, system simulation, transducers, virtual reality, wireless technology.

This work presents an innovative approach to build, control, and monitoring medical nanorobot in diagnosis of cancer for its early stage before metastasis. The proposed work uses biomedical flows, E-cadhering signal analyses, and RF CMOS, allied with mobile phones, for the nanorobot architecture development.

This same approach presented here could widely benefit likewise other diseases and medical problems, in areas such as cardiology, diabetes, and cell therapy. The use of nanoelectronics is enabling manufacturing nanoscale devices such as sensors and actuators for data transmission and assembly of transducers [1]. The nanorobots use a practical methodology for a collective action with a distributed sensing in the combat of cancer. A higher gradient of signal intensity of E-cadherin is used as chemical parameter identification in guiding nanorobots to identify malignant tissues. A nanorobot can effectively use chemical signals and targeted proteins to improve treatment intervention time to identify tumor cells [2]. A single tumor cell in a small venule is used as a target for medical diagnosis through tumor identification.

Thus, effective pervasive analyses can eliminate the risk to detect cancer only in advanced stages. Using medical nanorobotics, integrated nanoelectronics, and wireless system, as an optimal solution for cancer detection and diagnosis, can help save lives through more precise cellular malignant tissues identification. To validate our model, virtual reality using clinical data coupled with a real time 3D environment is used [3].

[1] Adriano Cavalcanti, Warren W. Wood, Luiz C. Kretly, Bijan Shirinzadeh, "Computational Nanomechatronics: A Pathway for Control and Manufacturing Nanorobots", IEEE CIMCA Int'l Conf. on Computational Intelligence for Modelling, Control and Automation, IEEE Computer Society, Sydney, Australia, November 2006.

[2] Adriano Cavalcanti, Tad Hogg, Bijan Shirinzadeh, Hwee C. Liaw, "Nanorobot Communication Techniques: A Comprehensive Tutorial", IEEE ICARCV Int'l Conf. on Control, Automation, Robotics and Vision, Grand Hyatt, Singapore, December 2006.

[3] Adriano Cavalcanti, Robert A. Freitas Jr., "Nanorobotics Control Design: A Collective Behavior Approach for Medicine", IEEE Transactions on NanoBioScience, Vol. 4, no. 2, pp. 133-140, June 2005.