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- ē Electr. & Comput. Eng. Sch., Campinas, Brazil (1)
- ē Dept. of Mech. Eng., Monash Univ., Clayton, VIC (1)

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ē **Assembly automation with evolutionary nanorobots and sensor-based control applied to nanomedicine**

Cavalcanti, A.

Nanotechnology, 2002. IEEE-NANO 2002. Proceedings of the 2002 2nd IEEE Conference on

Digital Object Identifier: [10.1109/NANO.2002.1032215](https://doi.org/10.1109/NANO.2002.1032215)

Publication Year: 2002 , Page(s): 161 - 164

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The author presents a new approach within advanced graphics simulations for the problem of nanoassembly automation and its application for medicine. The problem under study concentrates its main focus on **nanorobot** autonomous control for assembly manipulation and the use of evolutionary competitive agents as a suitable way to warranty the robustness of any proposed model. Thereby the presented paper summarizes as well distinct aspects of some techniques required to achieve a successful nanoplanning system design and its simulation visualization in real time. [View full abstract»](#)

ē **Hardware architecture for nanorobot application in cerebral aneurysm**

Cavalcanti, A.; Shirinzadeh, B.; Fukuda, T.; Ikeda, S.

Nanotechnology, 2007. IEEE-NANO 2007. 7th IEEE Conference on

Digital Object Identifier: [10.1109/NANO.2007.4601179](https://doi.org/10.1109/NANO.2007.4601179)

Publication Year: 2007 , Page(s): 237 - 242

IEEE CONFERENCE PUBLICATIONS
[Quick Abstract](#) | [PDF \(342 KB\)](#)

This paper presents an innovative hardware architecture for **medical** use of nanorobots proposed as an advanced and precise tool for brain aneurysm instrumentation and diagnosis. The feasibility of the outlined architecture is supported by nanobioelectronics, clinical data, and wireless technologies, as embedded integrated system devices for molecular machine data transmission and control upload. The upcoming therapeutic possibility of using nanorobots for aneurysm treatments is the natural result from some recent developments and trends in nanoelectronics, wireless communication, remote power transmission, quantum dots, nanotubes, SOI, lithography, biomedical instrumentation, genome mapping, and photonics. To illustrate the proposed

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approach, we applied advanced 3D simulation techniques as a practical choice on methodology for medical nanorobotics architecture and integrated system prototyping. [View full abstract»](#)

↳ Nanorobotics System Simulation in 3D Workspaces with Low Reynolds Number

Cavalcanti, A.; Hogg, T.; Shirinzadeh, B. *Micro-NanoMechtronics and Human Science, 2006 International Symposium on*
Digital Object Identifier: [10.1109/MHS.2006.320269](https://doi.org/10.1109/MHS.2006.320269)
Publication Year: 2006 , Page(s): 1 - 6

IEEE CONFERENCE PUBLICATIONS

| [Quick Abstract](#) | [PDF \(7465 KB\)](#)

We present a computational approach to enable the development of nanorobots operating in a fluid environment relevant for medical applications. Unlike the case of larger robots, the dominant forces in this environment arise from viscosity of low Reynolds number fluid flow and Brownian motion and such parameters are described throughout the paper. Hence, this paper describes a practical simulator that allows fast design methodology comparing various control algorithms for nanorobots and their suitability for different tasks. The simulator includes obstacles and identifiable targets, thereby providing a suitable environment for a typical nanorobot task: maintaining desired chemical concentrations near specific target areas [View full abstract»](#)

↳ Nanorobotic challenges in biomedical applications, design and control

Cavalcanti, A.; Rosen, L.; Kretly, L.C.; Rosenfeld, M.; Einav, S. *Electronics, Circuits and Systems, 2004. ICECS 2004. Proceedings of the 2004 11th IEEE International Conference on*
Digital Object Identifier: [10.1109/ICECS.2004.1399714](https://doi.org/10.1109/ICECS.2004.1399714)
Publication Year: 2004 , Page(s): 447 - 450

IEEE CONFERENCE PUBLICATIONS

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Ongoing developments in molecular fabrication, computation, sensors and motors will enable the manufacturing of nanorobots - nanoscale biomolecular machine systems. The present work constitutes a novel simulation approach, intended to be a platform for the design and research of nanorobot control. The simulation approach involves a combined and multi-scale view of the scenario. Fluid dynamics numerical simulation is used to construct the nanorobotic environment, and an additional simulation models nanorobot sensing, control and behavior. We discuss some of the most promising possibilities for nanorobotics applications in biomedical problems, paying a special attention to a stenosed coronary artery case. [View full abstract»](#)

↳ Assembly automation with evolutionary nanorobots and sensor-based control applied to nanomedicine

Cavalcanti, A. *Nanotechnology, IEEE Transactions on*
Volume: 2 , Issue: 2
Digital Object Identifier: [10.1109/TNANO.2003.812590](https://doi.org/10.1109/TNANO.2003.812590)
Publication Year: 2003 , Page(s): 82 - 87
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The author presents a new approach within advanced graphics simulations for the problem of nano-assembly automation and its application for medicine. The problem under study concentrates its main focus on nanorobot control design for assembly manipulation and the use of evolutionary competitive agents as a suitable way to warranty the robustness on the proposed model.

Thereby the presented paper summarizes as well distinct aspects of some techniques required to achieve a successful nano-planning system design and its simulation visualization in real time. [View full abstract»](#)

ē **Comment on "Nanorobotics control design: a collective behavior approach for medicine"**

Curtis, A.S.G.

NanoBioscience, IEEE Transactions on

Volume: 4 , Issue: 2

Digital Object Identifier: [10.1109/TNB.2005.850470](https://doi.org/10.1109/TNB.2005.850470)

Publication Year: 2005 , Page(s): 202 - 203

IEEE JOURNALS & MAGAZINES

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Following the paper by Calcavani and Freitas (see ibid., vol.4, no.2, p.133-40, 2005), the limitations on **nanorobot** design and activity imposed by Brownian motion events, communication problems, and the nature of the intercellular space are discussed. It is shown that severe problems exist for a **nanorobot** designed to enter tissues for therapeutic purposes when it is smaller than about 1 μm in any one of its dimensions.

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Year of Publication: 2006

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ABSTRACT

This paper describes an innovative work for nanorobot design and manufacturing, using a computer simulation and system on chip prototyping approach. The use of CMOS as integrated circuits, with the miniaturization from micro towards nanoelectronics, and the respective advances of nanowires are considered into the proposed model design and discussed as a practical pathway to enable embedded sensors for manufacturing nanorobots. The proposed nanorobot model is applied to hydrology monitoring. It can be useful for agriculture or environmental monitoring and management.

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 8. Accession number: 10208174

Title: Computational nanomechatronics: a pathway for control and manufacturing nanorobots

[Add a tag ?](#)Authors: Cavalcanti, A.¹; Wood, W.W.; Kretly, L.C.; Shirinzadeh, B.[Add](#)

Author affiliation: 1 Dept. of Mech. Eng., Monash Univ., Melbourne, VIC, Australia

Source: 2006 International Conference on Computational Intelligence for Modelling Control and Automation and International Conference on Intelligent Agents Web Technologies and International Commerce (CIMCA'06)



Publication date: 2006

Pages: 6 pp.

Language: English

ISBN-10: 0-7695-2731-0

Document type: Conference article (CA)

Conference name: 2006 International Conference on Computational Intelligence for Modelling Control and Automation and International Conference on Intelligent Agents Web Technologies and International Commerce (CIMCA'06)

Conference date: 29 Nov.-1 Dec. 2006

Conference location: Sydney, NSW, Australia

Publisher: IEEE

Place of publication: Piscataway, NJ, USA

Material Identity Number: YXA8-1901-844

Abstract: This paper describes an innovative work for nanorobot design and manufacturing, using a computer simulation and system on chip prototyping approach. The use of CMOS as integrated circuits, with the miniaturization from micro towards nanoelectronics, and the respective advances of nanowires are considered into the proposed model design and discussed as a practical pathway to enable embedded sensors for manufacturing nanorobots. The proposed nanorobot model is applied to hydrology monitoring. It can be useful for agriculture or environmental monitoring and management.

Number of references: 38

Inspec controlled terms: agriculture - CMOS integrated circuits - control system CAD - environmental management - hydrology - intelligent sensors - mechatronics - microrobots - nanoelectronics - nanowires - system-on-chip

Uncontrolled terms: computational nanomechatronics - nanorobot control - nanorobot manufacturing - nanorobot design - computer simulation - system on chip prototyping approach - CMOS - integrated circuits - nanoelectronics - nanowires - embedded sensors - hydrology monitoring - agriculture - environmental monitoring

Inspec classification codes: C3390 Robotics - C7420D Control system design and analysis - C3310C Control applications in agriculture - C3240N Intelligent sensors

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Discipline: Computers/Control engineering (C)

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Title: Assembly automation with evolutionary nanorobots and sensor-based control applied to nanomedicine

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Authors: Cavalcanti, A.¹

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Author affiliation: 1 Fraunhofer Inst. for Comput. Graphics, Darmstadt, Germany

Source title: IEEE Transactions on Nanotechnology



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Abbreviated source title: IEEE Trans. Nanotechnol. (USA)

Volume: 2

Issue: 2

Publication date: June 2003

Pages: 82-7

Language: English

ISSN: 1536-125X

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Document type: Journal article (JA)

Publisher: IEEE

Country of publication: USA

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Abstract: The author presents a new approach within advanced graphics simulations for the problem of nano-assembly automation and its application for medicine. The problem under study concentrates its main focus on nanorobot control design for assembly manipulation and the use of evolutionary competitive agents as a suitable way to warranty the robustness on the proposed model. Thereby the presented paper summarizes as well distinct aspects of some techniques required to achieve a successful nano-planning system design and its simulation visualization in real time.

Number of references: 28

Inspec controlled terms: assembly planning - biomedical engineering - evolutionary computation - microrobots

Uncontrolled terms: assembly automation - evolutionary nanorobots - sensor-based control - nanomedicine - advanced graphics simulations - nano-assembly automation - nanorobot control design - evolutionary competitive agents - robustness - nano-planning system design - simulation visualization

Inspec classification codes: A8770J Prosthetics and other practical applications - A0710C Micromechanical devices and systems - C3385 Biological and medical control systems - C7420 Control engineering computing - C3260P Microactuators - C7330 Biology and medical computing - C3355F Control applications in assembling - E0410D Industrial applications of IT - E1520C Assembling - E1550 Control technology and theory - E1550A Robotics - E1640 Instrumentation - E3654 Medical equipment and supplies industry

Treatment: Applications (APP); Practical (PRA); Experimental (EXP)

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Pages: 6 pp.

Language: English

ISBN-10: 14244 0342 1

Document type: Conference article (CA)

Conference name: 2006 9th International Conference on Control, Automation, Robotics and Vision

Conference date: 5-8 Dec. 2006

Conference location: Singapore

Publisher: IEEE

Place of publication: Piscataway, NJ, USA

Material Identity Number: XX2007-00580

Abstract: This work presents chemical communication techniques for **nanorobots** foraging in fluid environments relevant for medical applications. Unlike larger robots, viscous forces and rapid diffusion dominate their behaviors. Examples range from modified microorganisms to **nanorobots** using ongoing developments in molecular computation, sensors and motors. The **nanorobots** use an innovative methodology to achieve decentralized control for a distributed collective action in the combat of cancer. A communication approach is described in the context of recognizing a single tumor cell in a small venue as a target for medical treatment. Thus, 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 communication to improve intervention time to identify tumor cells.

Number of references: 29

Inspec controlled terms: [cancer](#) - [chemical variables measurement](#) - [decentralised control](#) - [medical robotics](#) - [microrobots](#) - [nanobiotechnology](#) - [patient treatment](#) - [tumours](#)Uncontrolled terms: [nanorobot](#) communication - [chemical communication](#) - [fluid environment](#) - [medical application](#) - [molecular computation](#) - [decentralized control](#) - [distributed collective action](#) - [cancer](#) - [medical treatment](#) - [signal intensity](#) - [E-cadherin](#) - [chemical parameter identification](#) - [malignant tissue identification](#) - [tumor cell identification](#) - [biomedical engineering](#) - [endothelial cell](#) - [nanomechatronic](#) - [nanomedicine](#) - [nanotechnology](#)Inspec classification: [A8783](#) Nanotechnology applications in biomedicine - [A8770G](#) Patient care and treatment - [C3385](#)codes: Biological and medical control systems - [C3390](#) Robotics - [C1340B](#) Multivariable control systems

Treatment: Practical (PRA)

Discipline: Physics (A); Computers/Control engineering (C)

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Record 16 from Inspec for: nanorobots, 1785-2009

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 16. Accession number: 9864214Title: [Nanorobots for laparoscopic cancer surgery](#)[Add a tag ?](#)Authors: [Cavalcanti, A.](#)¹; [Shirinzadeh, B.](#)¹; [Murphy, D.](#); [Smith, J.A.](#)[Public](#) [▼](#)[Add](#)Author affiliation: ¹ Monash Univ., Clayton, Australia

Source: 2007 International Conference on Computer and Information Science



Publication date: 2007

Pages: 715-20

Language: English

ISBN-10: [0-7895-2841-4](#)

Document type: Conference article (CA)

Conference name: 2007 International Conference on Computer and Information Science

Conference date: 11-13 July 2007

Conference location: Melbourne, Qld., Australia

Publisher: IEEE

Place of publication: Piscataway, NJ, USA

Material Identity Number: [YXA8-1900-483](#)

Abstract: This paper presents an innovative hardware architecture for medical **nанороботы**, using nanobioelectronics, clinical data, and wireless technologies, as embedded integrated system devices for molecular machine data transmission and control upload, and show how to use it in cancer surgery. The integration of medical nanorobotics and surgical teleoperation has the use of robotic laparoscopy concepts. To illustrate the proposed approach, we applied advanced 3D simulation techniques as a practical choice on methodology for molecular machine integrated system analyses and biomedical instrumentation prototyping.

Number of references: 29

Inspec controlled terms: [medical robotics](#) - [nanoelectronics](#) - [tele robotics](#)Uncontrolled terms: [laparoscopic cancer surgery](#) - [innovative hardware architecture](#) - [medical nanorobots](#) - [nanobioelectronics](#) - [clinical data](#) - [wireless technologies](#) - [embedded integrated system devices](#) - [molecular machine data transmission](#) - [surgical teleoperation](#) - [3D simulation techniques](#)Inspec classification codes: [C3385](#) Biological and medical control systems - [C3390T](#) Telerobotics

Treatment: Practical (PRA)

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Record 2 from Inspec for: ((nanorobot hardware) WN KY), 1785-2009

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□ 2. Accession number: 9958588

Title: **Nanorobot architecture for medical target identification**[Add a tag ?](#)Authors: Cavalcanti, A.¹; Shirinzadeh, B.; Freitas, R.A., Jnr; Hogg, T.[Add](#)

Author affiliation: 1 CAN Center for Autom. in Nanobiotech., Melbourne, VIC, Australia

Source title: Nanotechnology



Abbreviated source title: Nanotechnol. (UK)

Volume: 19

Issue: 1

Publication date: 9 Jan. 2008

Pages: 015103-1-15

Language: English

ISSN: 0957-4484

CODEN: NNOTER

Document type: Journal article (JA)

Publisher: IOP Publishing Ltd.

Country of publication: UK

Material Identity Number: ET07-2008-012

Abstract: This work has an innovative approach for the development of **nanorobots** with sensors for medicine. The **nanorobots** operate in a virtual environment comparing random, thermal and chemical control techniques. The **nanorobot** architecture model has nanobioelectronics as the basis for manufacturing integrated system devices with embedded nanobiosensors and actuators, which facilitates its application for medical target identification and drug delivery. The **nanorobot** interaction with the described workspace shows how time actuation is improved based on sensor capabilities. Therefore, our work addresses the control and the architecture design for developing practical molecular machines. Advances in nanotechnology are enabling manufacturing nanosensors and actuators through nanobioelectronics and biologically inspired devices. Analysis of integrated system modeling is one important aspect for supporting nanotechnology in the fast development towards one of the most challenging new fields of science: molecular machines. The use of 3D simulation can provide interactive tools for addressing **nanorobot** choices on sensing, **hardware** architecture design, manufacturing approaches, and control methodology investigation.

Number of references: 129

Inspec controlled terms: biomedical electronics - biomolecular electronics - DNA - drug delivery systems - medical robotics - microsensors - molecular biophysics - nanobiotechnology - nanoelectronics

Uncontrolled terms: **nanorobot** - medical target identification - medicine - virtual environment - nanobioelectronics - integrated system devices - nanobiosensors - actuators - nanosensors - drug delivery - **nanorobot** interaction - nanotechnology - biologically inspired devices - DNA molecular machine

Inspec classification codes: A8783 Nanotechnology applications in biomedicine - A8770G Patient care and treatment - A8715 Molecular biophysics - B2230B Biomolecular electronics - B7520 Patient care and treatment - B7230M Microsensors - C3385 Biological and medical control systems - C3390C Mobile robots - C3240P Microsensors

Treatment: Practical (PRA)

Discipline: Physics (A); Electrical/Electronic engineering (B); Computers/Control engineering (C)

DOI: 10.1088/0957-4484/19/01/015103

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Record 6 from Inspec for: ((nanorobot) WN KY), 1785-2009

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 6. **Accession number:** 10007702**Title:** Medical **nanorobotics** for diabetes control[Add a tag ?](#)**Authors:** Cavalcanti, A.¹; Shirinzadeh, B.; Kretly, L.C.[Add](#)**Author affiliation:** 1 CAN Center for Autom. in Nanobiotech., Melbourne, VIC, Australia**Source title:** Nanomedicine: Nanotechnology, Biology, and Medicine**Abbreviated source title:** Nanomed. Nanotechnol. Biol. Med. (Netherlands)**Volume:** 4**Issue:** 2**Publication date:** June 2008**Pages:** 127-38**Language:** English**ISSN:** 1549-9634**Document type:** Journal article (JA)**Publisher:** Elsevier Science B.V.**Country of publication:** Netherlands**Material Identity Number:** DP17-2008-002

Abstract: This work presents an innovative **nanorobot** architecture based on nanobioelectronics for diabetes. The progressive development toward the therapeutic use of **nanorobots** should be observed as the natural result from some ongoing and future achievements in biomedical instrumentation, wireless communication, remote power transmission, nanoelectronics, new materials engineering, chemistry, proteomics, and photonics. To illustrate the **nanorobot** integrated circuit architecture and layout described here, a computational approach with the application of medical **nanorobotics** for diabetes is simulated using clinical data. Integrated simulation can provide interactive tools for addressing **nanorobot** choices on sensing, hardware design specification, manufacturing analysis, and methodology for control investigation. In the proposed 3D prototyping, a physician can help the patient to avoid hyperglycemia by means of a handheld device, like a cell phone enclosed with cloth, that is used as a smart portable device to communicate with **nanorobots**. Therefore, this architecture provides a suitable choice to establish a practical medical **nanorobotics** platform for *in vivo* health monitoring. [All rights reserved Elsevier].

Number of references: 106**Inspec controlled terms:** [diseases](#) - [medical robotics](#) - [nanobiotechnology](#) - [patient monitoring](#)**Uncontrolled terms:** [medical nanorobotics](#) - [diabetes control](#) - [nanobioelectronics](#) - [nanorobot integrated circuit architecture](#) - [3D prototyping](#) - [in vivo health monitoring](#) - [nanobiosensor](#) - [hardware design specification](#) - [manufacturing analysis](#) - [control methodology](#)**Inspec classification codes:** C3385 Biological and medical control systems - C3390 Robotics**Treatment:** Bibliography (BIB); Practical (PRA)**Discipline:** Computers/Control engineering (C)**DOI:** 10.1016/j.nano.2008.03.001**Database:** Inspec

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A Cavalcanti, B Shirinzadeh, M Zhang, LC Kretly - Sensors, 2008 - mdpi.org

... Although optical communication permits faster rates of data transmission, its energy demand makes it not ideal for medical **nanorobotics** [92]. ... for the **nanorobots** depending on customized requirements [5]. In defining the **nanorobot** application, ...[Cited by 6](#) - [Related articles](#) - [View as HTML](#) - [All 10 versions](#)[PDF] ► [Nanorobot architecture for medical target identification-](#) ► [nchu.edu.tw](#) [PDF]

A Cavalcanti, B Shirinzadeh, RA Freitas Jr, T Hogg - Nanotechnology, 2008 - iop.org

... aims to establish a useful frame-work as a testbed for **nanorobot** foraging inside ... Then, the considered therapeutic use of **nanorobots** includes cancer and intracranial treatments. ... provides a methodolog- ical approach that helps in the development of **nanorobotics** for medical ...[Cited by 11](#) - [Related articles](#) - [BL Direct](#) - [All 3 versions](#)[PDF] ► [Hardware architecture for nanorobot application in cerebral aneurysm](#)

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A Cavalcanti, B Shirinzadeh, T Hogg, JA Smith - IEEE-RAS ICAR Int'l Conf. On ..., 2007 - Citeseer

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... Keywords: Architecture, cancer, **hardware**, integrated circuit, medical **nanorobotics**, nanobioelectronics, nanomechatronics, nanomedicine ... position [1]. The simulation includes the NCD (**Nanorobot** Control Design) software for the **nanorobots** interactive operation [18]. ...[Cited by 2](#) - [Related articles](#) - [View as HTML](#) - [All 3 versions](#)[PDF] ► [Medical nanorobot architecture based on nanobioelectronics-](#) ► [psu.edu](#) [PDF]

A Cavalcanti, B Shirinzadeh, RA Freitas, ... - Recent Patents on ..., 2007 - ingentaconnect.com

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A Cavalcanti, B Shirinzadeh, LC Kretly - ... : Nanotechnology, Biology, and ..., 2008 - Elsevier

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... As discussed throughout the paper, to achieve a complete **nanorobot** assembly based on dynamic capability behavior, different ... [3] A. Cavalcanti, RA Freitas Jr., "Nanorobotics Control Design: A ... [4] A. Cavalcanti, "Assembly Automation with Evolutionary **Nanorobots** and Sensor ...[Related articles](#) - [View as HTML](#) - [All 2 versions](#)[PDF] ► [Nanorobot for Brain Aneurysm](#)

A Cavalcanti, B Shirinzadeh, T Fukuda, S ... - The International Journal ..., 2009 - jjr.sagepub.com

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Author(s): Cavalcanti A, Shirinzadeh B, Fukuda T, et al.

Source: **INTERNATIONAL JOURNAL OF ROBOTICS RESEARCH** Volume: 28

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Author(s): Cavalcanti A, Shirinzadeh B, Kretly LC

Source: **NANOMEDICINE-NANOTECHNOLOGY BIOLOGY AND MEDICINE**

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3. Title: [Hardware Architecture for Nanorobot Application in Cerebral Aneurysm](#)

Author(s): Cavalcanti A, Shirinzadeh B, Fukuda T, et al.

Conference Information: 7th IEEE Conference on Nanotechnology, AUG 02-05,

2007 Hong Kong, PEOPLES R CHINA

Source: **2007 7TH IEEE CONFERENCE ON NANOTECHNOLOGY, VOL 1-3**

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4. Title: [Nanorobot hardware architecture for medical defense](#)

Author(s): Cavalcanti A, Shirinzadeh B, Zhang MJ, et al.

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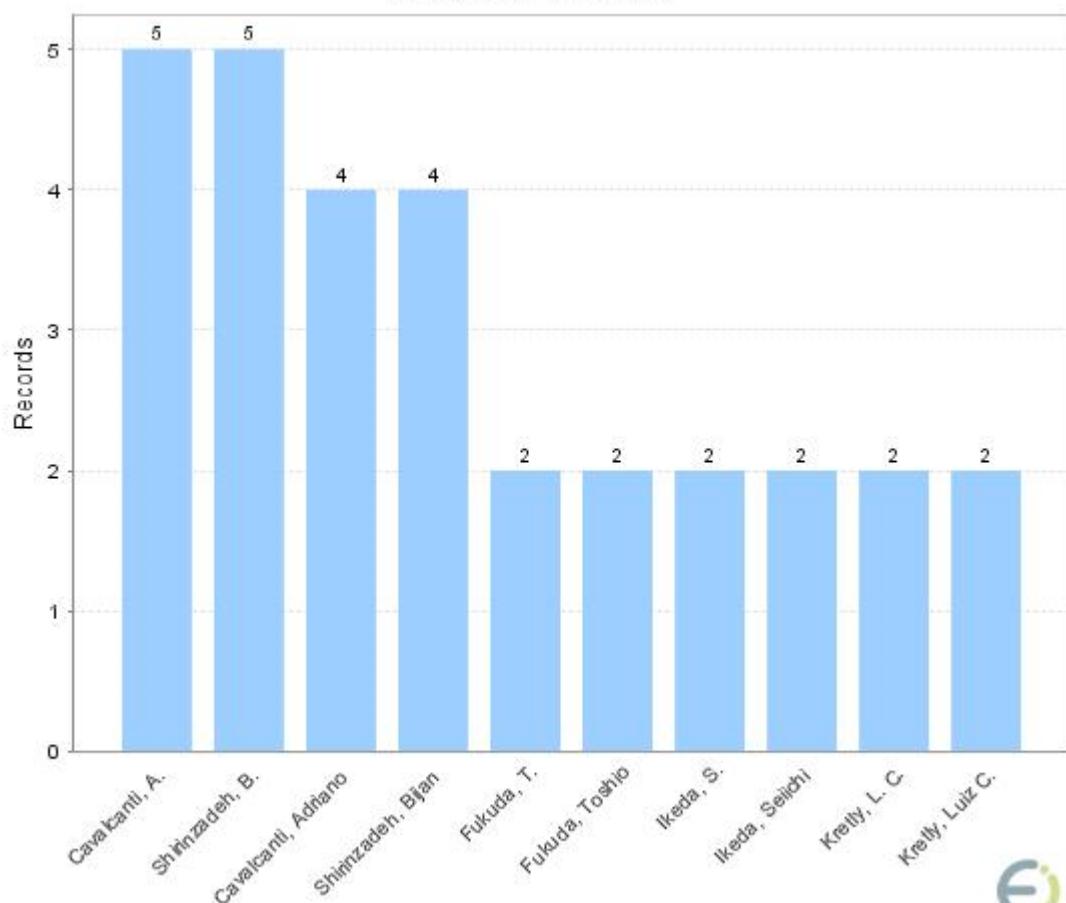


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