Cédric Girerd, PhD

CNRS Researcher, Robotics

Research Interests

Medical Robots, Continuum Robots, Soft Robots, Inspection devices

Positions

Since Feb. 2022 — **Full-time CNRS Researcher - CR2 (Faculty-level tenured position), Section 07**, *LIRMM*, Montpellier, France

June 2022 – Dec. 2022 — **Visiting Scholar**, *University of California San Diego, Electrical and Computer Engineering Department*, San Diego, USA,
Advisor: Michael C. Yip
Design and control of continuum and soft robots for medical applications

Feb. 2022 – June 2022 — **Visiting Scholar**, *University of California San Diego, Mechanical and Aerospace Engineering Department*, San Diego, USA,
Advisor: Tania K. Morimoto
Design and control of continuum and soft robots for medical applications

Feb. 2019 – Jan. 2022 — **Postdoctoral Scholar**, *University of California San Diego, Mechanical and Aerospace Engineering Department*, San Diego, USA,
Advisor: Tania K. Morimoto
Design and control of continuum and soft robots for medical applications

Feb. 2018 – Feb. 2019 — **Postdoctoral Researcher**, *FEMTO-ST*, Besançon, France,
Advisor: Kanty Rabenorosoa
Design and control of continuum robots for medical applications

Apr. 2014 – Oct. 2014 — **Engineer**, *University of Cambridge, Department of Engineering*, Cambridge, UK,
Advisor: Peter J.G. Long
Design of an autonomous system for tunnel inspection

Jun. 2013 – Oct. 2013 — **Engineer**, *Fraunhofer ISE*, Freiburg im Breisgau, Germany,
Advisor: Maximilian Pospischil
Development of a high-throughput fine line metallization process for solar cells

161 rue Ada – 34095 Montpellier Cedex 5 – France
+33 7 70 12 59 87 • *cedric.girerd@lirmm.fr* • *cgirerd.github.io*
Age: 33

Education - Science

2015–2018 **PhD, Medical Robotics**, *Université de Strasbourg*, Strasbourg, France,
Title: Design of concentric tube robots and application to the inspection of the olfactory cells
Laboratories: ICube-AVR (Strasbourg, France) and FEMTO-ST (Besançon, France)
Advisors: Pierre Renaud and Kanty Rabenorosoa
Committee: Jocelyne Trocaz, Jérôme Szewczyk and Etienne Dombre
Duration: 36 months
Qualification obtained in CMU sections 60 and 61

2013–2014 **M.Sc. "Mechanical and Civil Engineering, Automation, Robotics"**, *Université Blaise-Pascal*, Clermont-Ferrand, France
Internship: Mobile robotics at the University of Cambridge (UK)

2011–2014 **Engineer (≈ M.Sc.), Mechatronics**, *SIGMA Clermont*, Clermont-Ferrand, France
Member of the consortium Mines-Télécom Institute

2008–2010 **CPGE**, *La Martinière Monplaisir*, Lyon, France
2-year intensive program preparing for the national competitive exam for entry to French top engineering schools - Physics and Engineering Science

Education - Others

2020 **Micro-MBA**, *Rady School of Management, University of California San Diego*, San Diego, USA

Teaching Activity

2023–2024 **Faculté des Sciences**, Montpellier, France
- Mechanical design (6h, Level: Master (graduate))

2017–2018 **ENSMM**, Besançon, France
- Control theory (27h, Level: Licence 3 (undergrad))

2016–2017 **ENSMM**, Besançon, France
- Control theory (64h, Level: Licence 3 (undergrad))

2015–2016 **INSA Strasbourg**, Strasbourg, France
- Introduction to robotics 2 (18h, Level: Licence 2 (undergrad))
- Introduction to robotics 3 (new course) (12h, Level: Licence 2 (undergrad))
- Control theory (36h, Level: Licence 3 (undergrad))
- Additive manufacturing (15h, Level: Master 1 (graduate))

161 rue Ada – 34095 Montpellier Cedex 5 – France
+33 7 70 12 59 87 • *cedric.girerd@lirmm.fr* • *cgirerd.github.io*
Age: 33

Publications

International journals with peer-review

[IJ1] J.-T. Lin, **C. Girerd**, B. T. Ostrander, P. Molaei, H. B. Gilbert, P. A. Weissbrod, J. Hwang, and T. K. Morimoto, "Closing the loop on concentric tube robot design: A case study on micro-laryngeal surgery," *IEEE Transactions on Biomedical Engineering (TBME)*, 2024 (Submitted).

[IJ2] **C. Girerd**, A. Alvarez, E. W. Hawkes, and T. K. Morimoto, "Material scrunching enables working channels in miniaturized vine-inspired robots," *IEEE Transactions on Robotics (T-RO)*, 2024, doi: 10.1109/TRO.2024.3370088.

[IJ3] R. Dunn, A. J. Joshy, J.-T. Lin, **C. Girerd**, T. K. Morimoto, and J. T. Hwang, "Scalable enforcement of geometric non-interference constraints for gradient-based optimization," *Structural and Multidisciplinary Optimization*, 2023, doi: 10.1007/s11081-023-09864-2.

[IJ4] C. Nwafor, **C. Girerd**, G. Laurent, T. K. Morimoto, and K. Rabenorosoa, "Design and fabrication of concentric tube robots: A survey," *IEEE Transactions on Robotics (T-RO)*, vol. 39, no. 4, pp. 2510–2528, 2023, doi: 10.1109/TRO.2023.3255512.

[IJ5] A. Gupta, D. Park, S. Bashar, **C. Girerd**, T. K. Morimoto, and D. Bharadia, "Forcesticker: Wireless, batteryless, thin flexible force sensors," *Proc. ACM Interact. Mob. Wearable Ubiquitous Technol.*, vol. 7, no. 1, mar 2023, doi: 10.1145/3580793.

[IJ6] J.-T. Lin, **C. Girerd**, J. Yan, J. Hwang, and T. K. Morimoto, "A generalized framework for concentric tube robot design using gradient-based optimization," *IEEE Transactions on Robotics (T-RO)*, vol. 38, no. 6, pp. 3774–3791, 2022, doi: 10.1109/TRO.2022.3180627.

[IJ7] D. Park, A. Gupta, S. Bashar, **C. Girerd**, D. Bharadia, and T. K. Morimoto, "Design and evaluation of a miniaturized force sensor based on wave backscattering," *IEEE Robotics and Automation Letters (RA-L)*, vol. 7, no. 3, pp. 7550–7557, 2022, doi: 10.1109/LRA.2022.3184767.

[IJ8] D. V. A. Nguyen, **C. Girerd**, P. Rougeot, O. Lehmann, L. Tavernier, J. Szewczyk, and K. Rabenorosoa, "A hybrid concentric tube robot for cholesteatoma laser surgery," *IEEE Robotics and Automation Letters (RA-L)*, vol. 7, pp. 462–469, January 2022, doi: 10.1109/LRA.2021.3128685.

[IJ9] **C. Girerd**, Q. Zhang, A. Gupta, M. Dunna, D. Bharadia, and T. K. Morimoto, "Towards a wireless force sensor based on wave backscattering for medical applications," *IEEE Sensors Journal*, vol. 21, no. 7, pp. 8903–8915, April 2021, doi: 10.1109/JSEN.2021.3049225.

[IJ10] **C. Girerd** and T. K. Morimoto, "Design and control of a hand-held concentric tube robot for minimally invasive surgery," *IEEE Transactions on Robotics (T-RO)*, vol. 37, no. 4, pp. 1022–1038, August 2021, doi: 10.1109/TRO.2020.3043668.

[IJ11] **C. Girerd**, A. V. Kudryavtsev, P. Rougeot, P. Renaud, K. Rabenorosoa, and B. Tamadazte, "Automatic follow-the-leader deployment of concentric tube robots

in the trachea based on visual slam," *Transactions of Biomedical Engineering and Bionics (T-MRB)*, vol. 2, no. 4, pp. 582–585, November 2020, doi: 10.1109/TMRB.2020.3034720.

[IJ12] **C. Girerd**, T. Schlinquer, N. Andreff, P. Renaud, and K. Rabenorosoa, "Design of concentric tube robots using tube patterning for follow-the-leader deployment," *Journal of Mechanisms and Robotics (JMR)*, vol. 13, no. 1, pp. 1–8, August 2020, doi: 10.1115/1.4047983.

[IJ13] **C. Girerd**, A. V. Kudryavtsev, P. Rougeot, P. Renaud, K. Rabenorosoa, and B. Tamadazte, "Slam-based follow-the-leader deployment of concentric tube robots," *IEEE Robotics and Automation Letters (RA-L)*, vol. 5, no. 2, pp. 548–555, April 2020, doi: 10.1109/LRA.2019.2963821.

[IJ14] **C. Girerd**, T. Lihoreau, K. Rabenorosoa, B. Tamadazte, M. Benassarou, L. Tavernier, L. Pazart, E. Haffen, N. Andreff, and P. Renaud, "In vivo inspection of the olfactory epithelium: Feasibility of robotized optical biopsy," *Annals of Biomedical Engineering (ABME)*, vol. 46, pp. 1951–1961, June 2018, doi: 10.1007/s10439-018-2076-9.

International conferences with peer-review and proceedings

[IC1] C. Benoist, **C. Girerd**, N. Zemiti, P. Poignet, and P. Berthet-Rayne, "Tendon-driven vs rod-driven continuum robots, a bench test evaluation," in *Hamlyn Symposium on Medical Robotics (HSMR)*, 2024 (Submitted).

[IC2] J. Lu, F. Liu, **C. Girerd**, and M. C. Yip, "Image-based pose estimation and shape reconstruction for robot manipulators and soft, continuum robots via differentiable rendering," in *International Conference on Robotics and Automation (ICRA)*, 2023, pp. 560–567, doi: 10.1109/ICRA48891.2023.10161066.

[IC3] M. Xie, **C. Girerd**, and T. K. Morimoto, "A 3-d haptic trackball interface for teleoperating continuum robots," in *2022 11th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob)*, 2022, doi: 10.1109/BioRob52689.2022.9925384.

[IC4] A. Giri, **C. Girerd**, X. Luo, R. Broderick, and T. K. Morimoto, "Modeling and design of soft, positive-pressure actuated suction cups for anchoring in minimally invasive surgery," in *2022 11th IEEE International Conference on Biomedical Robotics and Biomechatronics (Biorob)*, 2022, doi: 10.1109/BioRob52689.2022.9925508.

[IC5] A. Gupta, **C. Girerd**, M. Dunna, Q. Zhang, T. K. Morimoto, and D. Bharadia, "Wi-force: Wireless sensing and localization of contact forces on a space continuum," in *18th USENIX Symposium on Networked Systems Design and Implementation (NSDI 21)*. Boston, USA: USENIX Association, April 2021. ISBN 978-1-939133-21-2 pp. 827–844. [Online]. Available: https://www.usenix.org/conference/nsdi21/presentation/gupta

[IC6] **C. Girerd**, K. Rabenorosoa, P. Rougeot, and P. Renaud, "Towards optical biopsy of olfactory cells using concentric tube robots with follow-the-leader deployment," in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*,

Vancouver, Canada, September 2017, pp. 5661–5887, doi: 10.1109/IROS.2017.8206455.

[IC7] **C. Girerd**, K. Rabenorosoa, and P. Renaud, "Combining tube design and simple kinematic strategy for follow-the-leader deployment of concentric tube robots," in *Advances in Robot Kinematics 2016*, J. Lenarcic and J.-P. Merlet, Eds. Grasse, France: Springer International Publishing, June 2017, ch. 10, pp. 266–290. ISBN 978-3-319-56802-7 Doi: 10.1007/978-3-319-56802-7_3.

[IC8] S. Stent, **C. Girerd**, P. Long, and R. Cipolla, "A low-cost robotic system for the efficient visual inspection of tunnels," in *Proceedings of the 32nd International Symposium on Automation and Robotics in Construction (ISARC)*, Oulu, Finland, June 2015, pp. 523–530, doi: 10.22260/ISARC2015/0070.

National conferences with peer-review

[NC1] L. Tavernier, E. Haffen, **C. Girerd**, K. Rabenorosoa, P. Renaud, and B. Tamadazte, "Détection optique endonasale de la maladie d'alzheimer," in *8èmes Rencontres Corses en ORL et Chirurgie Cervico-Faciale*, Porto-Vecchio, Corse, June 2019.

[NC2] **C. Girerd**, K. Rabenorosoa, and P. Renaud, "Toward a robotized inspection of the olfactory epithelium," in *Surgetica*, Strasbourg, France, November 2017.

[NC3] **C. Girerd**, K. Rabenorosoa, and P. Renaud, "Concentric tube robots for inspection of olfactory cells," in *Journées des Jeunes Chercheurs en Robotique*, Paris, France, November 2016.

[NC4] **C. Girerd**, K. Rabenorosoa, and P. Renaud, "Synthesis of a new concentric tube robot for olfactory cells exploration," in *CRAS: Computer/Robot Assisted Surgery*, Pisa, Italy, September 2016.

International workshop

[IW1] **C. Girerd**, A. Alvarez, E. W. Hawkes, and T. K. Morimoto, "Miniaturized vine robots with working channels," in *IEEE ICRA Workshop on Soft Growing Robots: From Search-and-Rescue to Intraluminal Interventions*, London, UK, May 2023 (**Poster award: 3rd best prize**).

Communications

[COM1] A. Gupta, **C. Girerd**, M. Dunna, Q. Zhang, T. K. Morimoto, and D. Bharadia, "Expanding the horizons of wireless sensing: Sensing and localizing contact forces with signal reflections," *GetMobile: Mobile Comp. and Comm.*, vol. 25, no. 3, p. 38–42, jan 2022, doi: 10.1145/3511285.3511296.

Scientific Events

2019 Presenter, San Diego Robotics Forum

2018 Presenter at the Cybertech Days, Besançon, France (scientific event for middle school students)

2017 Organization committee of "Journée des Jeunes Chercheurs en Robotique" (JJCR)

2017 Treasurer of the IEEE/FEMTO-ST Student Chapter, Robotics and Automation Branch

Professional Membership and Service

Associate Editor
- IEEE RoboSoft (2024)

Journal Reviewing
- IEEE Transactions on Robotics (T-RO)
- IEEE/ASME Transactions on Mechatronics (T-Mech)
- IEEE Robotics and Automation Letters (RA-L)
- IEEE Transactions on Medical Robotics and Bionics (TMRB)
- IEEE Transactions on Biomedical Engineering (T-BME)
- International Journal of Advanced Robotic Systems (IJARS)

Conferences Reviewing
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE-RAS International Conference on Soft Robotics (RoboSoft)
- IEEE RAS/EMBS IEEE 9th International Conference on Biomedical Robotics and Biomechatronics (BioRob)
- Hamlyn Symposium on Medical Robotics (HSMR)

Languages

French	Native language
English	Fluent
German	Basic knowledge

Computer Skills

Operating Systems	GNU/Linux (Debian-based), Microsoft Windows
Languages	C/C++, Visual Basic, PIC programming
Design	PTC Creo, Solidworks, Catia, COMSOL Multiphysics
Computation	Matlab/Octave, Maple/Maxima
Others	MeshLab, LabVIEW, Blender, LaTeX

Hobbies and Interests

Sports	Road cycling, running
Computing	Supporter of several free and open-source projects (Free Software Foundation (FSF), LineageOS, among others)

161 rue Ada – 34095 Montpellier Cedex 5 – France
+33 7 70 12 59 87 • *cedric.girerd@lirmm.fr* • *cgirerd.github.io*
Age: 33