

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
- Feb. 2019 – **Postdoctoral Scholar**, *University of California San Diego, Mechanical and Aerospace Engineering Department*, San Diego, USA,
Jan. 2022 Advisor: Tania K. Morimoto
Design and control of continuum and soft robots for medical applications
- Feb. 2018 – **Postdoctoral Researcher**, *FEMTO-ST*, Besançon, France,
Feb. 2019 Advisor: Kanty Rabenorosoa
Design and control of continuum robots for medical applications
- Apr. 2014 – **Engineer**, *University of Cambridge, Department of Engineering*, Cambridge, UK,
Oct. 2014 Advisor: Peter J.G. Long
Design of an autonomous system for tunnel inspection
- Jun. 2013 – **Engineer**, *Fraunhofer ISE*, Freiburg im Breisgau, Germany,
Oct. 2013 Advisor: Maximilian Pospischil
Development of a high-throughput fine line metallization process for solar cells

Invited Positions

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

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))

Publications

International journals with peer-review

- [IJ1] **C. Giererd**, 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.
- [IJ2] R. Dunn, A. J. Joshy, J.-T. Lin, **C. Giererd**, 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.
- [IJ3] C. Nwafor, **C. Giererd**, G. Laurent, T. K. Morimoto, and K. Rabenoroso, "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.
- [IJ4] A. Gupta, D. Park, S. Bashar, **C. Giererd**, 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.
- [IJ5] J.-T. Lin, **C. Giererd**, 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.
- [IJ6] D. Park, A. Gupta, S. Bashar, **C. Giererd**, 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.
- [IJ7] D. V. A. Nguyen, **C. Giererd**, P. Rougeot, O. Lehmann, L. Tavernier, J. Szewczyk, and K. Rabenoroso, "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.
- [IJ8] **C. Giererd**, 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.
- [IJ9] **C. Giererd** 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.
- [IJ10] **C. Giererd**, A. V. Kudryavtsev, P. Rougeot, P. Renaud, K. Rabenoroso, 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.

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- [IJ11] **C. Giererd**, T. Schlinquer, N. Andreff, P. Renaud, and K. Rabenoroso, “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.
- [IJ12] **C. Giererd**, A. V. Kudryavtsev, P. Rougeot, P. Renaud, K. Rabenoroso, 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.
- [IJ13] **C. Giererd**, T. Lihoreau, K. Rabenoroso, 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] J. Lu, F. Liu, **C. Giererd**, 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.
- [IC2] M. Xie, **C. Giererd**, 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.
- [IC3] A. Giri, **C. Giererd**, 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.
- [IC4] A. Gupta, **C. Giererd**, 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>
- [IC5] **C. Giererd**, K. Rabenoroso, 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.
- [IC6] **C. Giererd**, K. Rabenoroso, 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.

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- [IC7] 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. Rabenoroso, 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. Rabenoroso, and P. Renaud, “Toward a robotized inspection of the olfactory epithelium,” in *Surgetica*, Strasbourg, France, November 2017.
- [NC3] **C. Girerd**, K. Rabenoroso, 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. Rabenoroso, 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.

Awards

- 2023 **Poster award: 3rd best prize, IEEE ICRA Workshop on Soft Growing Robots: From Search-and-Rescue to Intraluminal Interventions**

Invited Talks

- March 2024 **HK AI & Robotics Forum for Healthcare, Center for Artificial Intelligence and Robotics**, *Hong Kong Institute of Science & Innovation, Chinese Academy of Sciences*, Hong Kong, China, "Miniaturization of vine growing robots with working channels"
- October 2023 **Susan Calvin Colloquium**, *MEETT - Parc des Expositions et Centre de Conventions & Congrès de Toulouse*, Toulouse, France, "Vine robots for the deployment in fragile and complex environments"
- July 2022 **Continuum Robotics Laboratory**, *University of Toronto Mississauga*, Toronto, Canada (remote), "Hand-held continuum robots and wireless force sensors for medical applications"
- June 2021 **ICRA 2021**, *Xi'an International Convention and Exhibition Center*, Xi'an, China (remote), "Design and Control of a Hand-Held Concentric Tube Robot for Minimally Invasive Surgery"
Invited presentation from accepted TRO paper

Editorial Activities

- Conferences ○ Associate Editor, IEEE RoboSoft 2024

Reviewing Activities

- Journals ○ IEEE Transactions on Robotics (T-RO) **13 papers**
○ IEEE/ASME Transactions on Mechatronics (T-Mech) **4 papers**
○ IEEE Robotics and Automation Letters (RA-L) **25 papers**
○ IEEE Transactions on Medical Robotics and Bionics (TMRB) **2 papers**
○ International Journal of Advanced Robotic Systems (IJARS) **1 paper**
- Conferences ○ IEEE Inter. Conf. on Robotics and Automation (ICRA) **5 papers**
○ IEEE/RSJ Inter. Conf. on Intelligent Robots and Systems (IROS) **1 paper**
○ IEEE-RAS Inter. Conf. on Soft Robotics (RoboSoft) **2 papers**
○ IEEE RAS/EMBS IEEE Inter. Conf. on Biomedical Robotics and Biomechatronics (BioRob) **1 paper**
○ IEEE Inter. Conf. on Automation Science and Engineering (CASE) **1 paper**
○ Hamlyn Symposium on Medical Robotics (HSMR) **1 paper**

Languages

- French Native language
English Fluent
German Basic knowledge

Hobbies and Interests

- Sports Road cycling, running

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