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Education

The Johns Hopkins University

Ph.D. in Mechanical Engineering, September 1995
Advisor: Prof. Nitish V. Thakor, Department of Biomedical Engineering
Thesis: "Adaptive Suppression of Tremor for Improved Human-Machine Control"

Virginia Polytechnic Institute and State University

B.S. in Aerospace Engineering, December 1989
B.S. in Ocean Engineering, December 1989
Minor in Music

Professional Experience

2015-present	Research Professor, Robotics Institute, Carnegie Mellon University
2011-present	Courtesy faculty, Dept. of Mechanical Engineering, Carnegie Mellon University
2005-present	Courtesy faculty, Dept. of Biomedical Engineering, Carnegie Mellon University
2005-2015	Associate Research Professor, Robotics Institute, Carnegie Mellon University
2000-present	Director, Surgical Mechatronics Laboratory, Robotics Institute, Carnegie Mellon University
1999-2005	Systems Scientist, Robotics Institute, Carnegie Mellon University, Pittsburgh, PA
1998-present	Adjunct Professor, Dept. of Rehabilitation Science & Technology, University of Pittsburgh
1997-1999	Visiting Research Scientist, Robotics Institute, Carnegie Mellon University
1995-1997	Postdoctoral Research Associate, Robotics Institute, Carnegie Mellon University
1990	Data Analyst III, Automated Sciences Group, Washington, D.C.

Research Interests

Research interests include surgical and biomedical robotic systems, active compensation of physiological motion for micromanipulation and rehabilitation, mechatronics, control systems, signal processing, and assistive robotics.

Publications

Book Chapters

1. E. Vander Poorten, C. N. Riviere, J. J. Abbott, C. Bergeles, M. A. Nasser, J. U. Kang, R. Sznitman, K. Faridpooya, and I. Iordachita. Robotic retinal surgery. In: M. H. Abedin-Nasab, ed., *Handbook of Robotic and Image-Guided Surgery*, Amsterdam: Elsevier, pp. 627-672, 2019.
2. B. C. Becker, S. Voros, R. A. MacLachlan, G. D. Hager, and C. N. Riviere. Visual guidance of an active handheld microsurgical tool. In: J. Rosen, B. Hannaford, and R. M. Satava, eds., *Surgical Robotics: Systems, Applications, and Visions*, New York: Springer, pp. 355-368, 2011.
3. N. A. Patronik, T. Ota, M. A. Zenati, and C. N. Riviere. Accurate positioning for intervention on the beating heart using a crawling robot. In: J. Rosen, B. Hannaford, and R. M. Satava, eds., *Surgical Robotics: Systems, Applications, and Visions*, New York: Springer, 2011, pp. 105-121. Originally published in: Proc. 2nd IEEE Int. Conf. Biomed. Robot. Biomechatron. (BioRob), pp. 250-257, 2008.

4. U-X. Tan, W. T. Latt, C. Y. Shee, C. Riviere, and W. T. Ang. Modeling and control of piezoelectric actuators for active physiological tremor compensation. In: N. Sarkar, ed., *Human-Robot Interaction*, Vienna: I-Tech Education and Publishing, pp. 369-394, 2007.

Journal Articles

1. A. Ladak, R. J. Hajjar, S. Murali, J. J. Michalek, and C. N. Riviere. Cable tension optimization for an epicardial parallel wire robot. *Journal of Medical Devices*, 17(2):021006, 2023.
2. A. Venugopal, S. Moccia, S. Foti, A. Routray, R. A. MacLachlan, A. Perin, L. S. Mattos, A. K. Yu, J. Leonardo, E. De Momi, and C. N. Riviere. Real-time vessel segmentation and reconstruction for virtual fixtures for an active handheld microneurosurgical instrument. *Int. J. Comput. Assist. Radiol. Surg.*, 17(6):1069-1077, 2022.
3. I. I. Iordachita, M. D. de Smet, G. Naus, M. Mitsuishi, and C. N. Riviere. Robotic assistance for intraocular microsurgery: challenges and perspectives. *Proceedings of the IEEE*, 110(7):893-908, 2022.
4. A. Ladak, D. Dixit, M. S. Halbreiner, M. J. Passineau, S. Murali, and C. N. Riviere. Introducer design concepts for an epicardial parallel wire robot. *Robotic Surgery Research and Reviews*, 8:21-38, 2021.
5. E. T. Rasmussen, E. C. Shiao, L. Zourelis, M. S. Halbreiner, M. J. Passineau, S. Murali, and C. N. Riviere. Coronary vessel detection methods for organ-mounted robots. *Int. J. Med. Robot.*, 17:e2297, 2021.
6. E. T. Rasmussen, D. Guo, V. Murthy, R. Mishra, C. N. Riviere, and C. Majidi. A soft resistive sensor with a semi-circular cross-sectional channel for soft cardiac catheter ablation. *Sensors*, 21:4130, 2021.
7. Y. Han, A. Routray, J. O. Adeghate, R. A. MacLachlan, J. N. Martel, and C. N. Riviere. Monocular vision-based retinal membrane peeling with a handheld robot. *Journal of Medical Devices*, 15:031014, 2021.
8. X. Zha, L. Wehbe, R. Scabassi, Z. Mace, Y. Liang, A. Yu, J. Leonardo, B. Cheng, T. Hillman, D. Chen, and C. N. Riviere. A deep learning model for automated classification of intraoperative continuous EMG. *IEEE Transactions on Medical Robotics and Bionics*, 3(1):44-52, 2021.
9. J. Wirekoh, N. Parody, C. N. Riviere, and Y.-L. Park. Design of fiber-reinforced soft bending pneumatic artificial muscles for tremor suppression. *Smart Materials and Structures*, 30(1):015013, 2021.
10. N. Kumar, J. Wirekoh, S. Saba, C. N. Riviere, and Y.-L. Park. Soft miniaturized actuation and sensing units for dynamic force control of cardiac ablation catheters. *Soft Robotics*, 8(1):59-70, 2021. <https://doi.org/10.1089/soro.2019.0011>
11. S. Mukherjee, M. Kaess, J. N. Martel, and C. N. Riviere. EyeSAM: Graph-based localization and mapping of retinal vasculature during intraocular microsurgery. *Int. J. Comput. Assist. Radiol. Surg.*, 14(5):819-828, 2019.
12. N. A. Wood, D. Schwartzman, M. J. Passineau, M. S. Halbreiner, R. J. Moraca, M. A. Zenati, and C. N. Riviere. Organ-mounted robot localization via function approximation. *Int. J. Med. Robot.*, 15(2):e1971, 2019. <https://doi.org/10.1002/rcs.1971>
13. S. Yang, J. N. Martel, L. A. Lobes, Jr., and C. N. Riviere. Techniques for robot-aided intraocular surgery using monocular vision. *International Journal of Robotics Research*, 37(8):931-952, 2018.
14. E. Aranda-Michel, J. Yi, J. Wirekoh, N. Kumar, C. Riviere, D. Schwartzman, and Y.-L. Park. Miniaturized robotic end-effector with piezoelectric actuation and fiber optic sensing for minimally invasive cardiac procedures. *IEEE Sensors Journal*, 18(12):4961-4968, 2018.
15. N. A. Wood, D. Schwartzman, M. J. Passineau, R. J. Moraca, M. A. Zenati, and C. N. Riviere. Beating-heart registration for organ-mounted robots. *Int. J. Med. Robot.*, 14(4):e1905, 2018. <https://doi.org/10.1002/rcs.1905>
16. D. Braun, S. Yang, J. N. Martel, C. N. Riviere, and B. C. Becker. EyeSLAM: Real-time localization and mapping of retinal vessels during intraocular microsurgery. *Int. J. Med. Robot.*, 14(1):e1848, 2018. <https://doi.org/10.1002/rcs.1848>
17. C. A. Lehecky, W. Fellows-Mayle, J. A. Engh, and C. N. Riviere. Tip design for safety of steerable needles for robot-controlled brain insertion. *Robotic Surgery Research and Reviews*, 4:107-114, 2017.
18. N. A. Wood, M. A. Zenati, D. Schwartzman, and C. N. Riviere. Physiological motion modeling for organ-mounted robots. *Int. J. Med. Robot.*, 13(4):e1805, 2017. <https://doi.org/10.1002/rcs.1805>
19. D. A. Meglan, W. Lv, R. J. Cohen, and C. N. Riviere. Techniques for epicardial mapping and ablation with a miniature robotic walker. *Robotic Surgery Research and Reviews*, 4:25-31, 2017.

20. Y. Zhu, N. A. Wood, K. Fok, T. Yoshizumi, D. Park, H. Jiang, D. S. Schwartzman, M. A. Zenati, T. Uchibori, W. R. Wagner, and C. N. Riviere. Design of a coupled thermoresponsive hydrogel and robotic injection system for myocardial infarction therapy. *Annals of Thoracic Surgery*, 102(3):780-786, 2016.
21. A. D. Costanza, M. S. Breault, N. A. Wood, M. J. Passineau, R. J. Moraca, and C. N. Riviere. Parallel force/position control of an epicardial parallel wire robot. *IEEE Robot. Autom. Lett.*, 1(2):1186-1191, 2016.
22. S. Yang, R. A. MacLachlan, J. N. Martel, L. A. Lobes, Jr., and C. N. Riviere. Comparative evaluation of handheld robot-aided intraocular laser surgery. *IEEE Trans. Robotics*, 32(1):246-251, 2016.
23. T. S. Wells, S. Yang, R. A. MacLachlan, L. A. Lobes, Jr., J. N. Martel, and C. N. Riviere. Hybrid position/force control of an active handheld micromanipulator for membrane peeling. *Int. J. Med. Robot.*, 12(1):85-95, 2016.
24. S. Yang, L. A. Lobes, Jr., J. N. Martel, and C. N. Riviere. Handheld automated microsurgical instrumentation for intraocular laser surgery. *Lasers Surg. Med.*, 47(8):658-668, 2015.
25. D. Ding, S. Peral Rodríguez, R. A. Cooper, and C. N. Riviere. Improving target acquisition for computer users with athetosis. *Assistive Technology*, 27(1):52-58, 2015.
26. S. Yang, R. A. MacLachlan, and C. N. Riviere. Manipulator design and operation for a six-degree-of-freedom handheld tremor-cancelling microsurgical instrument. *IEEE/ASME Trans. Mechatron.*, 20(2):761-772, 2015.
27. B. C. Becker, R. A. MacLachlan, L. A. Lobes, Jr., G. D. Hager, and C. N. Riviere. Vision-based control of a handheld surgical micromanipulator with virtual fixtures. *IEEE Trans. Robot.*, 29(3):674-683, 2013.
28. W. T. Latt, U-X. Tan, A. Georgiou, A. E. Sidarta, C. N. Riviere, and W. T. Ang. A micro motion sensing system for micromanipulation tasks. *Sens. Actuators A Phys.*, 173(1):254-266, 2012.
29. N. A. Patronik, T. Ota, M. A. Zenati, and C. N. Riviere. Synchronization of epicardial crawling robot with heartbeat and respiration for improved safety and efficiency of locomotion. *Int. J. Med. Robot.*, 8(1):97-106, 2012.
30. R. A. MacLachlan, B. C. Becker, J. Cuevas Tabarés, G. W. Podnar, L. A. Lobes, Jr., and C. N. Riviere. Micron: an actively stabilized handheld tool for microsurgery. *IEEE Trans. Robot.*, 28(1):195-212, 2012.
31. W. T. Latt, U-X. Tan, C. N. Riviere, and W. T. Ang. Transfer function compensation in gyroscope-free inertial measurement units for accurate angular motion sensing. *IEEE Sensors Journal*, 12(5):1207-1208, 2012.
32. R. A. MacLachlan and C. N. Riviere. Power voltage-current convertor using quasi-complementary MOSFET current mirrors. *Electron. Lett.*, 47(21):1173-1175, 2011.
33. W. T. Latt, U-X. Tan, C. N. Riviere, and W. T. Ang. Placement of accelerometers for high sensing resolution in micromanipulation. *Sens. Actuators A Phys.*, 167:304-316, 2011.
34. J. A. Engh, D. Kondziolka, and C. N. Riviere. Percutaneous intracerebral navigation by duty-cycled spinning of flexible bevel-tipped needles. *Neurosurgery*, 67(4):1117-1123, 2010.
35. B. C. Becker, R. A. MacLachlan, L. A. Lobes, Jr., and C. N. Riviere. Semiautomated intraocular laser surgery using handheld instruments. *Lasers Surg. Med.*, 42:264-273, 2010.
36. W. T. Latt, U-X. Tan, C. Y. Shee, C. N. Riviere, and W. T. Ang. Compact sensing design of a hand-held active tremor compensation instrument. *IEEE Sensors Journal*, 9(12):1864-1871, 2009.
37. N. A. Patronik, T. Ota, M. A. Zenati, and C. N. Riviere. A miniature mobile robot for navigation and positioning on the beating heart. *IEEE Trans. Robot.*, 25(5):1109-1124, 2009.
38. U-X. Tan, W. T. Latt, C. Y. Shee, C. N. Riviere, and W. T. Ang. Feedforward controller of ill-conditioned hysteresis using singularity-free Prandtl-Ishlinskii model. *IEEE/ASME Trans. Mechatron.*, 14(5):598-605, 2009.
39. U-X. Tan, W. T. Latt, F. Widjaja, C. Y. Shee, C. N. Riviere, W. T. Ang. Tracking control of hysteretic piezoelectric actuator using adaptive rate-dependent controller. *Sens. Actuators A Phys.*, 150(1): 116-123, 2009.
40. R. A. MacLachlan and C. N. Riviere. High-speed microscale optical tracking using digital frequency-domain multiplexing. *IEEE Trans. Instrum. Meas.*, 58(6):1991-2001, 2009.
41. T. Ota, N. A. Patronik, D. Schwartzman, C. N. Riviere, and M. A. Zenati. Minimally invasive epicardial injection using a semi-autonomous robotic device. *Circulation*, 118(14 Suppl):S115-S120, 2008.
42. U. X. Tan, K. C. Veluvolu, W. T. Latt, C. Y. Shee, C. N. Riviere, and W. T. Ang. Estimating displacement of periodic motion with inertial sensors. *IEEE Sensors Journal*, 8(8):1385-1388, 2008.

43. W. T. Ang, P. K. Khosla, and C. N. Riviere. Feedforward controller with inverse rate-dependent model for piezoelectric actuators in trajectory-tracking applications. *IEEE/ASME Trans. Mechatron.*, 12(2):134-142, 2007.
44. W. T. Ang, P. K. Khosla, and C. N. Riviere. Nonlinear regression model of a low-g MEMS accelerometer. *IEEE Sensors Journal*, 7(1):81-88, 2007.
45. C. N. Riviere, J. Gangloff, and M. de Mathelin. Robotic compensation of biological motion to enhance surgical accuracy. *Proceedings of the IEEE*, 94(9):1705-1716, 2006.
46. T. Ota, N. Patronik, C. Riviere, and M. Zenati. Percutaneous subxiphoid access to the epicardium using a miniature crawling robotic device. *Innov. Technol. Tech. Cardiothorac. Vasc. Surg.*, 1(5):227-231, 2006.
47. N. A. Patronik, M. A. Zenati, and C. N. Riviere. Preliminary evaluation of a mobile robotic device for navigation and intervention on the beating heart. *Comput. Aided Surg.* 10(4):225-232, 2005.
48. C. N. Riviere, N. A. Patronik, and M. A. Zenati. A prototype epicardial crawling device for intrapericardial intervention on the beating heart. *Heart Surg. Forum*, 7(6):E639-E643, 2004.
49. C. N. Riviere, W. T. Ang, and P. K. Khosla. Toward active tremor canceling in handheld microsurgical instruments. *IEEE Trans. Robot. Autom.*, 19(5): 793-800, 2003.
50. G. Bonanomi, K. Rebello, K. Leboutz, C. Riviere, E. Di Martino, D. Vorp, and M. A. Zenati. Microelectro-mechanical systems for endoscopic cardiac surgery. *J. Thorac. Cardiovasc. Surg.*, 126(3):851-852, 2003.
51. R. H. Taylor, G. Fichtinger, P. Jensen, and C. Riviere. Medical robotics and computer-integrated surgery: information-driven systems for 21st-century operating rooms. *J. Jap. Soc. Comput. Aided Surg.*, 8(2):47-53, 2000.
52. C. N. Riviere, R. S. Rader, and N. V. Thakor. Adaptive canceling of physiological tremor for improved precision in microsurgery. *IEEE Trans. Biomed. Eng.*, 45(7):839-846, 1998.
53. C. N. Riviere, S. G. Reich, and N. V. Thakor. Adaptive Fourier modeling for quantification of tremor. *J. Neurosci. Methods*, 74(1):77-87, 1997.
54. C. N. Riviere and N. V. Thakor. Effects of age and disability on tracking tasks with a computer mouse: accuracy and linearity. *J. Rehabil. Res. Dev.*, 33(1):6-15, 1996.

Refereed Conference Papers

1. G. Russo, S. Moccia, J. N. Martel, A. Perin, R. F. Sekula, L. Bascetta, E. De Momi, and C. N. Riviere. Admittance control of a handheld microsurgical instrument. Proc. Hamlyn Symposium on Medical Robotics, pp. 109-110, 2019.
2. A. Routray, R. A. MacLachlan, J. N. Martel, and C. N. Riviere. Real-time incremental estimation of retinal surface using laser aiming beam. Int. Symp. Med. Robot., pp. 1-5, 2019.
3. E. Wilde, S. Dan, N. A. Wood, M. J. Passineau, M. S. Halbreiner, M. A. Zenati, and C. N. Riviere. Parallel position/force control of epicardial wire robot based on ellipsoid geodesy. Int. Symp. Med. Robot., pp. 1-5, 2019.
4. R. A. MacLachlan, R. L. Hollis, B. Jaramaz, J. N. Martel, K. L. Urish, and C. N. Riviere. Multirate Kalman filter rejects impulse noise in frequency-domain-multiplexed tracker measurements. Proc. IEEE Sensors Conf., pp. 591-593, 2017.
5. F. Prudente, S. Moccia, A. Perin, R. Sekula, L. S. Mattos, J. Balzer, W. Fellows-Mayle, E. De Momi, and C. Riviere. Toward safety enhancement in neurosurgery using a handheld robotic instrument. Proc. Hamlyn Symposium on Medical Robotics, pp. 15-16, 2017.
6. S. Mukherjee, S. Yang, R. A. MacLachlan, L. A. Lobes, Jr., J. N. Martel, and C. N. Riviere. Toward monocular camera-guided retinal vein cannulation with an actively stabilized handheld robot. Proc. IEEE Int. Conf. Robot. Autom. (ICRA), pp. 2951-2956, 2017.
7. D. A. Meglan, B. Bergeron, R. Bardsley, J. M. Galeotti, and C. N. Riviere. Techniques for avoidance of coronary vasculature during epicardial needle insertions with a miniature robotic walker. Proc. Int. Conf. Mechatron. Robot. Eng., pp. 1-5, 2017.
8. R. A. MacLachlan, R. L. Hollis, J. N. Martel, L. A. Lobes, Jr., and C. N. Riviere. Toward improved electromagnetic tracking for handheld robotics. Proc. Int. Conf. Mechatron. Robot. Eng., pp. 75-80, 2017.
9. S. Mukherjee, R. A. MacLachlan, and C. N. Riviere. Velocity-limiting control of an active handheld micromanipulator. *Journal of Medical Devices*, 10(3):030944-1—030944-2, 2016.

10. B. Gonenc, N. Tran, C. N. Riviere, P. Gehlbach, R. H. Taylor, and I. Iordachita. Force-based puncture detection and active position holding for assisted retinal vein cannulation. *Proc. IEEE Int. Conf. Multisensor Fusion and Integration*, pp. 322-327, 2015.
11. T. Vendrametto, J. S. McAfee, B. E. Hirsch, C. N. Riviere, G. Ferrigno, and E. De Momi. Robot assisted stapedotomy ex vivo with an active handheld instrument. *Proc. Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC)*, pp. 4879-82, 2015.
12. M. S. Breault, A. D. Costanza, N. A. Wood, M. J. Passineau, and C. N. Riviere. Toward hybrid force/position control for the Cerberus epicardial robot. *Proc. Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC)*, pp. 7776-9, 2015.
13. M. S. Breault, A. D. Costanza, N. A. Wood, M. J. Passineau, and C. N. Riviere. Auto-calibration for a planar epicardial wire robot. *Proc. IEEE Northeast Bioeng. Conf.*, pp. 1-2, 2015.
14. S. Yang, R. A. MacLachlan, and C. N. Riviere. Automated intraocular laser surgery using handheld micromanipulator. *Proc. IEEE Int. Conf. Intell. Robot. Syst. (IROS)*, pp. 1302-1307, 2014.
15. S. Sanan, Y. Chen, C. A. Lehockey, C. Gong, C. N. Riviere, and H. Choset. 3D motion planning for steerable needles using path sets. *Proc. Hamlyn Symposium on Medical Robotics*, pp. 79-80, 2014.
16. A. D. Costanza, N. A. Wood, M. J. Passineau, R. J. Moraca, S. H. Bailey, T. Yoshizumi, and C. N. Riviere. A parallel wire robot for epicardial interventions. *Proc. Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC)*, pp. 6155-6158, 2014.
17. C. A. Lehockey, Y. Shi, and C. N. Riviere. Hyper- and viscoelastic modeling of needle and brain tissue interaction. *Proc. Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC)*, pp. 6530-6533, 2014.
18. T. S. Wells, R. A. MacLachlan, and C. N. Riviere. Toward hybrid position/force control for an active handheld micromanipulator. *Proc. IEEE Int. Conf. Robot. Autom. (ICRA)*, pp. 772-777, 2014.
19. G. Wu, X. Li, C. A. Lehockey, and C. N. Riviere. Automatic steering of manually inserted needles. *Proc. IEEE Int. Conf. Systems, Man, and Cybernetics*, pp. 1488-1493, 2013.
20. T. S. Wells, S. Yang, R. A. MacLachlan, J. T. Handa, P. Gehlbach, and C. N. Riviere. Comparison of baseline tremor under various microsurgical conditions. *Proc. IEEE Int. Conf. Systems, Man, and Cybernetics*, pp. 1482-1487, 2013.
21. X. Li, C. A. Lehockey, and C. N. Riviere. Efficient 3D control for needle steering using duty-cycled rotation. *Proc. Int. Conf. Inform. Control Autom. Robot.*, vol. 2, pp. 192-199, 2013.
22. S. Yang, T. S. Wells, R. A. MacLachlan, and C. N. Riviere. Performance of a 6-degree-of-freedom active microsurgical manipulator in handheld tasks. *Proc. 35th Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC)*, pp. 5670-5673, 2013.
23. S. Yang, M. Balicki, T. S. Wells, R. A. MacLachlan, X. Liu, J. U. Kang, J. T. Handa, R. H. Taylor, and C. N. Riviere. Improvement of optical coherence tomography using active handheld micromanipulator in vitreoretinal surgery. *Proc. 35th Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC)*, pp. 5674-5677, 2013.
24. B. C. Becker and C. N. Riviere. Real-time retinal vessel mapping and localization for intraocular surgery. *Proc. IEEE Int. Conf. Robot. Autom. (ICRA)*, pp. 5346-5351, 2013.
25. N. A. Wood and C. N. Riviere. Algorithm for three-dimensional control of needle steering via duty-cycled rotation. *Proc. IEEE Int. Conf. Mechatron.*, pp. 237-241, 2013.
26. C. A. Lehockey, X. Li, and C. N. Riviere. Design and control considerations for safe needle steering in brain tissue. *Proc. IEEE Int. Conf. Comm. Comput. Control Appl.*, pp. 1-6, 2012.
27. N. A. Wood, K. Waugh, T. Y. Liu, M. A. Zenati, and C. N. Riviere. Space-time localization and registration on the beating heart. *Proc. IEEE/RSJ Int. Conf. Intell. Robot. Syst. (IROS)*, pp. 3792-3797, 2012.
28. B. Gonenc, M. Balicki, J. Handa, P. Gehlbach, C. Riviere, R. H. Taylor, and I. Iordachita. Evaluation of a micro-force sensing handheld robot for vitreoretinal surgery. *Proc. IEEE/RSJ Int. Conf. Intell. Robot. Syst. (IROS)*, pp. 4125-4130, 2012.
29. S. Yang, M. Balicki, R. A. MacLachlan, X. Liu, J. U. Kang, R. H. Taylor, and C. N. Riviere. Optical coherence tomography scanning with a handheld vitreoretinal micromanipulator. *Proc. 34th Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC)*, pp. 948-951, 2012.
30. G. Tortora, P. Glass, N. Wood, B. Aksak, A. Menciassi, M. Sitti, and C. N. Riviere. Investigation of bio-inspired gecko fibers to improve adhesion of HeartLander surgical robot. *Proc. 34th Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC)*, pp. 908-911, 2012.

31. C. A. Lehocky and C. N. Riviere. Needle insertion with duty-cycled rotation into multiple media. Proc. 34th Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC), pp. 916-919, 2012.
32. S. Rodríguez Palma, B. C. Becker, and C. N. Riviere. Comparative evaluation of monocular augmented-reality display for micromanipulation. Proc. 34th Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC), pp. 1409-1412, 2012.
33. G. Montes Grande, A. J. Knisely, B. C. Becker, S. Yang, B. E. Hirsch, and C. N. Riviere. Handheld micromanipulator for robot-assisted stapes footplate surgery. Proc. 34th Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC), pp. 1422-1425, 2012.
34. N. A. Wood, K. Waugh, T. Y. Liu, M. A. Zenati, and C. N. Riviere. Towards localizing on the surface of the beating heart. Proc. 34th Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC), pp. 1413-1416, 2012.
35. N. A. Wood, D. Schwartzman, M. A. Zenati, and C. N. Riviere. Toward onboard estimation of physiological phase for an epicardial crawling robot. Proc. IEEE Int. Conf. Biomed. Robot. Biomechatron. (BioRob), pp. 1-6, 2012.
36. B. C. Becker, S. Yang, R. A. MacLachlan, and C. N. Riviere. Towards vision-based control of a handheld micromanipulator for retinal cannulation in an eyeball phantom. Proc. IEEE Int. Conf. Biomed. Robot. Biomechatron. (BioRob), pp. 1-6, 2012.
37. C. Shi, B. C. Becker, and C. N. Riviere. Inexpensive monocular pico-projector-based augmented reality display for surgical microscope. Proc. 25th IEEE Int. Symp. Computer-Based Medical Systems, pp. 1-6, 2012.
38. S. Yang, R. A. MacLachlan, and C. N. Riviere. Design and analysis of 6 DOF handheld micromanipulator. Proc. IEEE Int. Conf. Robot. Autom. (ICRA), pp. 1946-1951, 2012.
39. B. C. Becker, R. A. MacLachlan, L. A. Lobes, Jr., and C. N. Riviere. Vision-based retinal membrane peeling with a handheld robot. Proc. IEEE Int. Conf. Robot. Autom. (ICRA), pp. 1075-1080, 2012.
40. G. Montes Grande, A. J. Knisely, B. C. Becker, S. Yang, B. E. Hirsch, and C. N. Riviere. Toward robot-assisted stapes fenestration with a handheld micromanipulator. Proc. IEEE Northeast Bioeng. Conf., pp. 141-142, 2012.
41. K. Fok, N. A. Wood, and C. N. Riviere. Improved locomotion for the HeartLander robot for injection of an anti-remodeling hydrogel. Proc. IEEE Northeast Bioeng. Conf., pp. 207-208, 2012.
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Invited Papers

1. S. Moccia, S. Foti, A. Routray, F. Prudente, A. Perin, R. F. Sekula, L. S. Mattos, J. R. Balzer, W. Fellows-Mayle, E. De Momi, and C. N. Riviere. Toward improving safety in neurosurgery with an active handheld instrument. *Annals of Biomedical Engineering*, 46(10):1450-1464, 2018.
2. R. A. MacLachlan, N. Parody, S. Mukherjee, R. L. Hollis, J. N. Martel, L. A. Lobes, Jr., and C. N. Riviere. Electromagnetic tracker for active handheld robotic systems. Proc. IEEE Sensors Conf., pp. 52-54, 2016.

3. C. Riviere. Design and application considerations for clinical acceptance of surgical robotics. Proc. Wksp. Evaluating Effectiveness and Acceptance of Robots in Surgery: User Centered Design and Economic Factors, IEEE Int. Conf. Robot. Autom. (ICRA), 2013.
4. S. Yang, R. A. MacLachlan, and C. N. Riviere. Performance of a six-axis handheld microsurgical robot with ultrasonic linear motors. Proc. 5th Annual Dynamic Systems and Control Conference, pp. 1-6, 2012.
5. R. Taylor, J. Kang, I. Iordachita, G. Hager, P. Kazanzides, C. Riviere, E. Gower, R. Richa, M. Balicki, X. He, X. Liu, K. Olds, R. Sznitman, B. Vagvolgyi, P. Gehlbach, J. Handa. Recent work toward a microsurgical assistant for retinal surgery. Proc. Hamlyn Symposium on Medical Robotics, pp. 3-4, 2011.
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9. C. N. Riviere and N. V. Thakor. Modeling and canceling tremor in human-machine interfaces. *IEEE Eng. Med. Biol. Mag.*, 15(3):29-36, 1996.

Unrefereed Conference Papers and Abstracts

1. J. Adeghate, Y. Han, A. Routray, R. A. MacLachlan, J. N. Martel, and C. N. Riviere. Membrane-peeling with a handheld tremor-cancelling robotic device for vitreoretinal surgery. Annual Meeting of the Association for Research in Vision and Ophthalmology, May 3-7, 2020.
2. S. Dan, Y. Ren, N. A. Bustos, N. A. Wood, M. J. Passineau, R. J. Moraca, and C. N. Riviere. Toward effective three-dimensional control of an epicardial wire robot. Proceedings of the Joint Workshop on New Technologies for Computer/Robot Assisted Surgery, pp. 91-92, 2018.
3. S. Moccia, F. Prudente, E. De Momi, C. Riviere, A. Perin, R. Sekula, L.S. Mattos. Safety enhancement in robotic neurosurgery through vessel tracking. Proceedings of the Joint Workshop on New Technologies for Computer/Robot Assisted Surgery, pp. 38-39, 2016.
4. A. D. Costanza, N. A. Wood, M. J. Passineau, R. J. Moraca, and C. N. Riviere. Accurate gene drug delivery for heart failure. Proc. Int. Conf. Heart and Brain, 2016.
5. C. A. Lehocky, J. A. Engh, and C. N. Riviere. White matter tract-following with flexible needles for targeting subcortical structures. Proc. Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC), p. 1, 2015.
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9. A. J. Knisely, B. E. Hirsch, B. C. Becker, and C. N. Riviere. Robotic tremor suppression: a tool for stapes surgery? *Otolaryngol. Head Neck Surg.* 147(2 Suppl):P220, Aug. 2012.
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11. C. N. Riviere. Actuated handpiece for teledermatological diagnosis and intervention. 3rd World Congress of Teledermatology, Amsterdam, 2010.
12. N. A. Wood, K. Shahrour, M. C. Ost, and C. N. Riviere. Closed-loop control of needle steering for percutaneous kidney access. Proc. Wksp. Snakes, Worms and Catheters: Continuum and Serpentine Robots for Min. Invas. Surg., IEEE Int. Conf. Robot. Autom. (ICRA), 2010.
13. C. Riviere, B. Becker, R. MacLachlan, and L. Lobes. Semiautomated intraocular laser surgery using handheld instruments. 30th Annu. Conf. Am. Soc. Laser Med. Surg., April 16, 2010.

14. K. Olds, S. Sibenaller, D. Ding, R. A. Cooper, and C. N. Riviere. Modeling and filtering athetoid movement for assistive computer interfaces. *Proc. IASTED Int. Conf. Assist. Technol.*, pp. 123-128, 2008.
15. T. Ota, N. A. Patronik, C. N. Riviere, and M. A. Zenati. Epicardial injection using a miniature crawling robotic device through a subxiphoid approach. *Annu. Mtg. Int. Soc. Min. Invas. Cardiac Surg. (ISMICS)*, Rome, June 6-9, 2007.
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20. M. A. Gomez-Blanco, C. N. Riviere, and P. K. Khosla. Intraoperative tremor monitoring for vitreoretinal microsurgery. *Proc. Medicine Meets Virtual Reality 8*, pp. 99-101, 2000.
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25. C. N. Riviere. A finite element model of the Hybrid III ribcage. *Proc. 18th Int. Wksp. Hum. Subj. Biomech. Res.*, pp. 55-59, 1990.

Technical Reports

1. X. Zha, L. Wehbe, R. J. Scabassi, Z. Mace, Y. V. Liang, T. A. Hillman, D. A. Chen, A. Yu, J. Leonardo, B. C. Cheng, C. N. Riviere. Toward automated interpretation of electromyography for intraoperative neurophysiological monitoring using machine learning. Technical Report CMU-RI-TR-20-07, Robotics Institute, Carnegie Mellon University, 2020.
2. M. Siegel and C. N. Riviere. Defect-detection technologies for low-observability aircraft skin coatings. Technical Report CMU-RI-TR-17-31, Robotics Institute, Carnegie Mellon University, 2017.
3. R. A. MacLachlan and C. N. Riviere. Optical tracking for performance testing of microsurgical instruments. Technical Report CMU-RI-TR-07-01, Robotics Institute, Carnegie Mellon University, 2007.
4. M. Gomez-Blanco, C. Riviere, and P. Khosla. Sensing hand tremor in a vitreoretinal microsurgical instrument. Technical Report CMU-RI-TR-99-39, Robotics Institute, Carnegie Mellon University, 1999.

Patents and Invention Disclosures

- C. N. Riviere, N. A. Patronik, M. A. Zenati, and G. Stetten. Robot for minimally invasive interventions. U. S. Patent No. 8,162,925, issued Apr. 24, 2012.
- N. Wood and C. Riviere. Deployable polygonal manipulator for minimally invasive surgical interventions. U.S. Patent No. 10,736,703, issued Aug. 11, 2020.

Awards

Best Paper, *IEEE/ASME Transactions on Mechatronics*, 2016.

Finalist for Best Medical Robotics Paper, IEEE International Conference on Robotics and Automation, 2016.

Best Paper, IEEE International Conference on Multisensor Fusion and Integration, 2015.

Best Application Paper, IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2014.

Best Paper, 28th World Congress on Endourology and SWL, 2010.

Best Surgical Applications e-Poster, 30th Annual Conference of the American Society for Laser Medicine and Surgery, 2010.

Best Mini Presentation, Annual Scientific Meeting, International Society for Minimally Invasive Cardiothoracic Surgery, 2007.

Second Place, IEEE Engineering in Medicine and Biology Society Whitaker Foundation Student Paper Competition, 1995.

Invited Presentations

1. iHUB Research Program, Shenzhen, China, Feb. 4, 2024.
2. 11th European Summer School on Surgical Robotics, Montpellier, France, Sept. 1, 2023.
3. Workshop on Advanced Robotics and Visualization for Ophthalmic Surgery, IEEE IROS Conference, Kyoto, Japan, Oct. 23, 2022.
4. Fall School on Medical Robotics, Atlanta, Nov. 16, 2021.
5. Department of Mechanical and Aerospace Engineering Seminar, University of California, San Diego, Nov. 12, 2021.
6. 10th European Summer School on Surgical Robotics, Montpellier, France, Sept. 22, 2021.
7. Workshop on Integrating Sensor Fusion and Perception for Human-robot Interaction, IEEE RO-MAN Conference, Sept. 1, 2020.
8. Neuroscience Institute Grand Rounds, Allegheny Health Network, Pittsburgh, Aug. 5, 2020.
9. 9th European Summer School on Surgical Robotics, Montpellier, France, Sept. 26, 2019.
10. International Symposium on Medical Robotics, Atlanta, April 5, 2019.
11. Workshop on Robot-Assisted Eye Surgery: Steps toward the Operating Room, International Symposium on Medical Robotics, Atlanta, April 3, 2019.
12. North American Spring School on Medical Robotics, Atlanta, April 1, 2019.
13. Workshop on Assistive Technologies for Precision Neurosurgery: Current Success and Future Challenges, IEEE/RSJ Int. Conf. Intell. Robot. Syst. (IROS), Madrid, Oct. 1, 2018.
14. 8th European Summer School on Surgical Robotics, Montpellier, France, Sept. 12, 2017.
15. Department of Mechanical Engineering, University of Colorado, Boulder, Apr. 6, 2017.
16. IEEE SENSORS Conference, Orlando, Oct. 31, 2016.
17. Rehabilitative and Regenerative Medicine for Minority Health and Health Disparities, Pittsburgh, June 9, 2016.
18. 7th European Summer School on Surgical Robotics, Montpellier, France, Sept. 7, 2015.
19. Workshop on Smart Surgical Devices, Hamlyn Symposium on Medical Robotics, London, July 15, 2014.
20. Henry Ford Innovation Institute, Henry Ford Health System, Detroit, February 5, 2014.
21. Workshop on Cognitive Surgical Robotics: From Virtual Fixtures to Advanced Cooperative Control, IEEE/RSJ Int. Conf. Intell. Robot. Syst. (IROS), Tokyo, Nov. 7, 2013.
22. 6th European Summer School on Surgical Robotics, Montpellier, France, Sept. 9, 2013.

23. Workshop on Human-Robot Interaction for Surgical Robotics, Hamlyn Symposium on Medical Robotics, London, June 25, 2013.
24. Workshop on Evaluating Effectiveness and Acceptance of Robots in Surgery: User Centered Design and Economic Factors, IEEE Int. Conf. Robot. Autom. (ICRA), Karlsruhe, Germany, May 6, 2013.
25. 8th Annual Coordinated Science Laboratory Student Conference, University of Illinois at Urbana-Champaign, Feb. 1, 2013.
26. 60th Annual Reliability and Maintainability Symposium, Orlando, Fla., Jan. 28, 2013.
27. ASME Dynamic Systems and Control Conference, Ft. Lauderdale, Fla., Oct. 17, 2012.
28. Congress of Neurological Surgeons, Annual Meeting, Chicago, Oct. 8, 2012.
29. Gerald McGinnis Cardiovascular Institute, Allegheny General Hospital, Pittsburgh, Pa., Oct. 2, 2012.
30. Minisymposium on Bio-inspired Surgical Robotics, 34th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), San Diego, Aug. 31, 2012.
31. 3rd North American Summer School on Image-Guided Interventions, Surgical Robotics & Simulation, London, Ontario, Aug. 14, 2012.
32. IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob), Rome, June 24, 2012.
33. Advances in Optics for Biotechnology, Medicine, and Surgery XII, Naples, Fla., June 7, 2011.
34. Department of Mechanical Engineering Seminar, Technical University of Delft, Netherlands, Oct. 27, 2010.
35. Department of Mechanical Engineering Seminar, Technical University of Eindhoven, Netherlands, Oct. 26, 2010.
36. Biomechanics Day Symposium, University of Pittsburgh, Sept. 21, 2010.
37. Keynote lecture, 3rd Hamlyn Symposium on Medical Robotics, The Royal Society, London, May 25, 2010.
38. Workshop on Snakes, Worms and Catheters: Continuum and Serpentine Robots for Minimally Invasive Surgery, IEEE International Conference on Robotics and Automation (ICRA), Anchorage, Alaska, May 3, 2010.
39. Stanford Medical Innovation Conference, Stanford University, Apr. 10, 2010.
40. Department of Mechanical Engineering and Applied Mechanics Seminar, University of Pennsylvania, Feb. 25, 2010.
41. 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Minneapolis, Sept. 3, 2009.
42. Workshop on Control Issues in the Micro/Nano World, IEEE International Conference on Robotics and Automation (ICRA), Kobe, Japan, May 17, 2009.
43. Department of Ophthalmology Seminar, University of Pittsburgh, Apr. 1, 2009.
44. Department of Bioengineering Seminar, University of Pittsburgh, Mar. 5, 2009.
45. IEEE-RAS/IFRR School of Robotics Science on Medical Robotics and Computer-Integrated Interventional Systems, Baltimore, Jan. 16, 2009.
46. Special Plenary Session on Microrobotic Systems for Biomedical Applications, IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob), Scottsdale, Arizona, Oct. 20, 2008.
47. Workshop on Surgical Robotics, IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob), Scottsdale, Arizona, Oct. 19, 2008.
48. Department of Urology Seminar, University of Pittsburgh, Sept. 17, 2008.
49. Workshop on Needle Steering: Recent Results and Future Opportunities, International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI), New York, Sept. 6, 2008.
50. Minisymposium on Pathways to Success in Biomedical Engineering, 30th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC), Vancouver, B.C., Aug. 22, 2008.
51. Ethicon Endo-Surgery Robotics Expert Panel Workshop, Cincinnati, Ohio, July 22, 2008.
52. Department of Neurological Surgery Seminar, University of Pittsburgh, May 23, 2007.

53. AO Foundation, Comprehensive Expert Group Meeting 07-1, New York, Mar. 24, 2007.
54. Minimally Invasive Surgical Technology Institute Seminar, Cedars-Sinai Medical Center, Los Angeles, Mar. 21, 2007.
55. Robotics Research Centre Seminar, Nanyang Technological University, Singapore, Dec. 8, 2006.
56. XVth International Conference on Mechanics in Medicine and Biology, Singapore, Dec. 7, 2006.
57. Department of Mechanical Engineering, University of South Florida, Mar. 24, 2006.
58. McGowan Institute for Regenerative Medicine, University of Pittsburgh, Jan. 26, 2006.
59. Integrated Research Team Meeting, U.S. Army Telemedicine and Advanced Technology Research Center (TATRC), Marina del Rey, California, Sept. 9, 2004.
60. IARP International Workshop on Medical Robotics, Hidden Valley, Pennsylvania, May 20, 2004.
61. Keynote address, Career Day, Instituto Tecnológico y de Estudios Superiores de Monterrey (ITESM), Monterrey, Mexico, Nov. 7, 2003.
62. Ethicon Endo-Surgery, Inc., Cincinnati, Ohio, Oct. 9, 1998.
63. Workshop on Face and Gesture Recognition and its Applications, 6th ACM International Multimedia Conference, Bristol, England, Sept. 12, 1998.
64. Weapons and Systems Engineering Department Seminar, United States Naval Academy, May 6, 1997.
65. Graduate Colloquium Series, Department of Electrical Engineering, Northern Illinois University, March 6, 1997.

Courses Taught

Medical Robotics (16-879), Robotics Institute, Carnegie Mellon University, Fall, 2021-present.

Robotics Capstone (16-474), Robotics Institute, Carnegie Mellon University, Spring, 2017-present.

Mechatronic Design (16-778), Robotics Institute, Carnegie Mellon University, Spring, 2018-present.

Sensing and Sensors (16-722), Robotics Institute, Carnegie Mellon University, Fall, 2017-present.

Dynamic Systems and Controls (24-352), Dept. of Mechanical Engineering, Carnegie Mellon University, Spring 2016.

Consulting and Expert Witness Service

Consultant to Daley & Orton, LLC, Warwick, R.I., regarding supermarket-monitoring robots, 2023.

Expert in a patent litigation case in U.S. District Court regarding surgical robotics, 2020-.

Expert in a patent litigation case in U.S. District Court regarding surgical robotics, 2019-20.

Consultant to Morgan, Lewis & Bockius, LLP, Philadelphia, regarding autonomous/robotic wheelchairs, 2017.

Consultant to Omniboros, Inc., regarding surgical robotics, 2017.

Consultant to Temasek Holdings, Inc., Singapore, regarding surgical robotics, 2016.

Consultant to Goren, Goren & Harris PC, Bingham Farms, Mich., regarding hospital delivery robots, 2016.

Declaration to the U.S. Patent and Trademark Office in re *Inter Partes* Reexamination of U.S. Patent No. 7,158,118, “3D Pointing Devices with Orientation Compensation and Improved Usability,” working for Hillcrest Laboratories, Inc., through Finnegan, Henderson, Farabow, Garrett & Dunner, LLP, 2012.

Expert witness in International Trade Commission Investigation No. 337-TA-658, “In the Matter of Certain Video Game Machines and Related Three-Dimensional Pointing Devices,” working for Hillcrest Laboratories, Inc., through Finnegan, Henderson, Farabow, Garrett & Dunner, LLP, 2008-2009. Provided reports, claim construction opinions, depositions, and hearing testimony.

Consultant to Ethicon Endo-Surgery for Robotics Expert Panel Workshop, Cincinnati, Ohio, 2008.

Consultant to Cedars-Sinai Medical Center, Los Angeles, 2007, regarding compensation of hand tremor in surgical robotic systems.

Consultant to Veterans Affairs Health System in Pittsburgh, 2000, regarding filtering of pathological tremor in assistive computer interfaces.

Professional Activities

Guest editor, Hamlyn Symposium Special Issue, *IEEE Transactions on Medical Robotics and Bionics*, 2020.

Guest editor, Special Issue on Medical Robotics, *Annals of Biomedical Engineering*, 2018.

Associate Editor, Conference Editorial Board, IEEE Robotics and Automation Society, 2010-present.

Associate Editor, Conference Editorial Board, IEEE Engineering in Medicine and Biology Society, 2008-present.

Programme Committee, Hamlyn Symposium on Medical Robotics, 2011-present.

Advisory Committee, Pittsburgh CREATES (Collaborative Research, Education, And Technology Enhancement in Surgery), 2018-present.

Technical Committee, 3rd International Conference on Mechatronics and Robotics Engineering, Paris, Feb. 8-12, 2017.

Co-chair, 4th Biennial North American Summer School on Surgical Robotics, July 21-25, 2014.

Program Committee, Robotics Science and Systems (RSS), Berkeley, July 12-16, 2014.

Member, Task Group on Robotic-Assisted Interventions, American Association of Physicists in Medicine, 2013-14.

International Program Committee, 11th International Conference on Informatics in Control, Automation and Robotics (ICINCO), Vienna, Sept. 2-4, 2014.

Technical Program Committee, Second Workshop on Assistive Computer Vision and Robotics (ACVR2014), Columbus, Ohio, June 23, 2014.

Co-chair, Workshop on Cooperative Control in Surgical Robotics, Hamlyn Symposium on Medical Robotics, London, June 25, 2013.

Scholarship and Fellowship Selection Committee (Electrical Engineering and Computer Science), Natural Sciences and Engineering Research Council (NSERC), Canada, 2009-2012.

Co-organizer, Workshop on "Flexible Neurosurgical Robotics," 34th Annu. Int. Conf. IEEE Eng. Med. Biol. Society (EMBC), San Diego, Aug. 28, 2012.

Organizer, Minisymposium on Robotic Single-Port Surgery and NOTES, 34th Annu. Int. Conf. IEEE Eng. Med. Biol. Soc. (EMBC), San Diego, Aug. 28-Sep. 1, 2012.

Co-Chair, Theme 8: Biorobotics and Biomechanics, 34th Annu. Int. Conf. IEEE Eng. Med. Biol. Society (EMBC), San Diego, Aug. 28-Sep. 1, 2012.

Executive Program Committee, IEEE Int. Conf. Biomedical Robotics and Biomechatronics (BioRob), Rome, June 24-28, 2012.

Co-organizer, Workshop on Pathways to Clinical Needle Steering: Recent Advances and Future Applications, IEEE Int. Conf. Robot. Autom. (ICRA), May 14-18, 2012.

Invited participant, FDA Workshop on Medical Care Robots, Silver Spring, Md., Feb. 19, 2010.

Track Chair, BMES Annual Fall Scientific Meeting, Pittsburgh, Pa., Oct. 7-10, 2009.

Scientific Review Committee, 12th Int. Conf. Medical Image Computing and Computer Assisted Intervention (MICCAI), London, Sept. 20-24, 2009.

Program Committee, IEEE Int. Conf. on Complex Medical Engineering, Tempe, Az., Apr. 9-11, 2009.

Organizing Committee, IEEE-RAS/IFRR School of Robotics Science on Medical Robotics and Computer-Integrated Interventional Systems, Baltimore, Jan. 12-16, 2009.

Program Committee, IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob), Scottsdale, Az., Oct. 19-22, 2008.

Track Chair, 29th Annu. Int. Conf. IEEE Engineering in Medicine and Biology Society, Lyon, France, Aug. 23-26, 2007.

Guest editor, Special Issue on Medical Robotics, *Proceedings of the IEEE*, 2006.

Proceedings Co-Chair, 1st IEEE RAS/EMBS Int. Conf. Biomedical Robotics and Biomechatronics (BioRob), Pisa, Italy, Feb. 20-22, 2006.

Committee Member, IEEE-RAS Technical Committee on Surgical Robotics, 2004-present.

Organizing Committee, IARP Workshop on Medical Robotics, May 20-24, 2004.

Local Arrangements Committee, 3rd Int. Conf. Med. Image Comput. and Comput. Asst. Interv. (MICCAI), Pittsburgh, Pa., Oct. 11-14, 2000.

Research proposal reviewer for:

- National Institutes of Health (including, among others):
 - Charter member, Bioengineering, Technology, and Surgical Sciences [BTSS] Study Section, 2019-2023.
 - Bioengineering, Technology, and Surgical Sciences [BTSS] Study Section, Oct. 2015.
 - Small Business PAR Panel: Cardiovascular and Surgical Devices; Feb. 2015, June 2015, Nov. 2015; Mar. 2016.
 - Small Business PAR Panel: Safe and Effective Instruments and Devices for Use in Neonatal and Pediatric Care Settings (ZRG1 SBIB-V (55)), Mar. 2014.
 - Study section ZRG1 BBBP-E (53) R, Apr. 2013.
 - Study section ZRG1 SBIB-V (82) S, Jan. 2013.
 - Study section ZRG1 SBIB-U (57), Oct. 2011.
 - NIBIB Special Emphasis Panel 2010/10 ZEB1 OSR-B (01) 1, June 2010.
 - Special Emphasis Panel/Scientific Review Group 2009/05 ZGM1 NDIA-O (01) Z (Director's New Innovator Awards), Apr. 2009.
 - Biomedical Imaging Technology [BMIT] Study Section, Oct. 2008 and Oct. 2010.
 - Special Emphasis Panel/Scientific Review Group 2007/05 ZEB1 OSR-B (M1) (R) for Image Guided Intervention RFA, Mar. 2007.
 - Special Emphasis Panel/Scientific Review Group 2006/01 ZEB1 OSR-B (J1) (S) for Career Development and Institutional Training Grants, Nov. 2005.
 - Special Emphasis Panel/Scientific Review Group ZEB1 OSR-B (M1) for Career Development, Institutional Training Grant, and Residency Supplement Review, Feb. 2005.
- National Science Foundation
- National Aeronautics and Space Administration
- Department of Veterans Affairs
- Center for Integration of Medicine & Innovative Technology (CIMIT)
- The Wellcome Trust
- Royal National Institute for Deaf People, UK
- Health Research Board, Ireland
- National Science Foundation, Switzerland
- Natural Sciences and Engineering Research Council, Canada
- Agency for Science, Technology, and Research (A*STAR), Singapore
- National Medical Research Council, Singapore
- Qatar National Research Foundation
- American Association for the Advancement of Science

Journal reviewer for:

- *IEEE Transactions on Robotics*
- *International Journal of Robotics Research*
- *International Journal of Medical Robotics and Computer Assisted Surgery*
- *IEEE/ASME Transactions on Mechatronics*
- *IEEE Transactions on Biomedical Engineering*
- *IEEE Transactions on Instrumentation and Measurement*
- *IEEE Transactions on Neural Systems and Rehabilitation Engineering*
- *IEEE Transactions on Visualization and Computer Graphics*

- *IEEE/ASME Journal of MEMS*
- *IEEE Transactions on Circuits and Systems I*
- *IEEE Transactions on Control Systems Technology*
- *British Journal of Ophthalmology*
- *ASME Journal of Mechanical Design*
- *Journal of Rehabilitation Research and Development*
- *Medical Engineering and Physics*
- *Experimental Brain Research*
- *Annals of Surgery*
- *Journal of Medical Devices*
- *International Journal of Advanced Robotic Systems*
- *Applied Bionics and Biomechanics*
- *Computers in Biology and Medicine*

Conference reviewer for:

- Robotics: Science and Systems
- IEEE International Conference on Robotics and Automation (ICRA)
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI)
- Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)
- IEEE International Conference on Biomedical Robotics and Biomechatronics (BioRob)
- Hamlyn Symposium on Medical Robotics
- ASME Dynamic Systems and Control Conference (DSCC)
- Design of Medical Devices Conference
- Biomedical Engineering Society (BMES) Annual Meeting
- IEEE/ICME International Conference on Complex Medical Engineering
- RESNA Annual Conference
- International Conference on Mechatronics and Control Engineering
- International Conference on Informatics in Control, Automation and Robotics
- International Conference on Advances in Computer-Human Interaction

Memberships:

- Senior Member, IEEE
 - Robotics and Automation Society
 - Engineering in Medicine and Biology Society

Educational and Community Outreach

Co-leader of robotics club (Lego Mindstorms) for inner-city middle-school students at The Pittsburgh Project, 2013-present.

Member, Diversity Committee, NSF Engineering Research Center on Computer-Integrated Surgical Systems and Technology, 2005-2008.

Committee member, Research and Technology Sector, Disability Agenda 2000, Allegheny County, Pennsylvania, 1999.

University Service

Carnegie Mellon University

Faculty Senate, 2014-16.

Invited participant, Designing a Business Summit: Designing Market-Driven Robotics Solutions in Healthcare, Tepper School of Business, Aug. 20-21, 2009.

Judge, Sigma Xi Poster Competition, CMU Undergraduate Research Symposium, 2005.

Biomedical and Health Engineering Committee, Biotechnology/Health Policy Task Force Workshop, 1998.

School of Computer Science

Undergraduate Review Committee, 2023-present.

Graduate PC Ad Hoc Committee, 2004.

The Robotics Institute

Co-Director, B.S. in Robotics program, 2023-.

Director, Additional Major in Robotics, 2021-.

M.S. Admissions Committee, 2022-.

Robotics Double Major Admissions Committee, 2019.

Ph.D. Admissions Committee, 2015-18 (chairman, 2017-18).

Ph.D. Admissions Committee, 2006-9.

Sandia Fellowship Ad Hoc Review Committee, 2006.

Chairman, Faculty Hiring Committee, 2005.

Grants

“A Handheld Tissue Force Microscope,” NIH R01, 3/1/2024-1/31/2028.

“Precise Minimally Invasive Treatment of VT Using Non-invasive Mapping,” NIH SBIR Fast-Track (subcontract from HeartLander Surgical, Inc.), 8/15/2017-3/31/2022.

“Multi-Frequency Tracker for Control of Handheld Surgical Robotic Systems,” NIH R01, 3/1/2018-12/31/2021.

“An Active Handheld Micromanipulator,” NIH R01 (renewal), 8/1/15-6/30/19.

“Dynamic Force Control of Cardiac Ablation Catheters,” 12/1/14-11/30/16.

“EX-SCAN: Autonomous Inspection System for Aircraft Surface Coatings,” Air Force Research Laboratory STTR Phase II, 3/1/16-2/28/18 (subcontract from Intelligent Automation, Inc.).

“Tremor-Corrective Handheld Manipulator for Vitreoretinal Microsurgery,” NIH SBIR Phase I (subcontract from New Scale Technologies, Inc.), 2/1/16-1/31/17.

“EX-SCAN: Autonomous Inspection System for Aircraft Surface Coatings,” Air Force Research Laboratory STTR Phase I, 3/1/16-11/30/15 (with Mel Siegel).

“Fourth Biennial North American Summer School in Surgical Robotics,” NIH R13, 2014.

“System for Semi-automated Minimally-invasive Myocardial Gene Transfer,” Disruptive Health Technologies Institute, Highmark/Carnegie Mellon University, 2013-14.

“North American Summer School in Surgical Robotics,” IEEE Robotics and Automation Society, 2014.

“Biodegradable, Thermoresponsive Hydrogels to Treat Ischemic Cardiomyopathy,” NIH R01 (subcontract from University of Pittsburgh), 2/1/11-1/31/16.

“Robotic Crawler for Epicardial Interventions,” NIH R01 (renewal), 6/1/09-5/31/14.

“An Active Handheld Micromanipulator,” NIH R01 (renewal), 2/1/11-1/31/14.

“Safe Flexible Intracerebral Navigation with Steerable Needles,” NIH R21, 5/1/11-4/30/13.

“A Microsurgical Assistant System,” NIH R01 Bioengineering Research Partnership (subcontract from Johns Hopkins University), 8/1/08-6/30/13.

“Semiautomated Intraocular Laser Surgery using Handheld Instruments” (renewal), American Society for Laser Medicine and Surgery, 6/1/08-5/31/09.

“Image Guidance for Active Handheld Microsurgical Tools,” NIH R21, 8/1/06-7/31/08.

“Nonlinear Filtering of Athetoid Movement,” NIH R21, 8/1/06-7/31/08.

“Robotic Crawler for Epicardial Interventions,” NIH R01, 7/1/05-5/31/08.

“Engineering Research Center for Computer Integrated Surgical Systems and Technology,” NSF (subcontract from Johns Hopkins University), 9/1/98-8/31/08.

“Semiautomated Intraocular Laser Surgery using Handheld Instruments,” American Society for Laser Medicine and Surgery, 6/1/07-5/31/08.

“Needle Steering to Access Deep Brain Tumors,” The Pittsburgh Foundation, 8/15/06-8/14/07.

“An Active Handheld Micromanipulator,” NIH R01, 1/1/03-12/31/06.

“Steering Flexible Needles to Access Deep Brain Tumors,” The Pittsburgh Foundation, 7/1/05-6/30/06.

“Docking Endoscopic Tools to the Beating Heart,” The Pittsburgh Foundation, 7/1/02-6/30/04.

“Intelligent Filtering for Assistive Interfaces,” The Pittsburgh Foundation, 7/1/00-6/30/02.

“Active Error Canceling for Manual Micromanipulation,” NIH R21, 5/1/00-4/30/02.

“Augmentation of Manual Precision in Microsurgery,” Johnson & Johnson Focused Giving Program, 10/1/97-9/30/00.