CURRICULUM VITAE OF

MARK L. NAGURKA, *Ph.D., P.E.*

December 2018

Present Position: Associate Professor of Mechanical and Biomedical Engineering
Director, Machine Design Laboratory
Director, Fluid Power and Mechatronics Research Laboratory
Marquette University   414-288-3513
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Education: **Ph.D.** (1983) in Mechanical Engineering
Massachusetts Institute of Technology, Cambridge, MA 02139
(Thesis: *Curving Performance of Rail Passenger Vehicles,* Advisor: J.K. Hedrick)

M.S.E. (1979) in Mechanical Engineering & Applied Mechanics
University of Pennsylvania, Philadelphia, PA 19104
(Thesis: *Leg Motion Gait Analysis by Multi-Axial Accelerometry,* Advisor: W.C. Hayes)

B.S.E. (1978) in Mechanical Engineering & Applied Mechanics
University of Pennsylvania, Philadelphia, PA 19104

Areas of Expertise:
- **Mechatronics**: Modeling, Dynamics, and Control of Mechanical and Electromechanical Systems.
- **Design**: Design of Mechanical and Electromechanical Systems.
- **Engineering Education**: Discovery Learning, Student-Centered Learning, Laboratory Experiments.

Experience:
- Associate Professor of Mechanical and Biomedical Engineering   August 1996 - present
Marquette University, Milwaukee, WI
- Senior Research Engineer   June 1994 - August 1996
Carnegie Mellon Research Institute, Pittsburgh, PA
- Associate Professor of Mechanical Engineering   September 1989 - May 1994
Assistant Professor of Mechanical Engineering   August 1983 - August 1989
Carnegie Mellon University, Pittsburgh, PA

Professional Registration:
- Professional Engineer, State of Wisconsin, 34374-006 (registered 2000).
- Professional Engineer, Commonwealth of Pennsylvania, PE-038040-E (registered 1988).

Membership in Professional Societies
- Fellow, American Society of Mechanical Engineers (ASME)
- Member, American Society of Engineering Education (ASEE)

Honors and Awards

- Outstanding Teacher Award, Opus College of Engineering, Marquette University, 2015-2016.
- Lafferty Professor, College of Engineering, Marquette University, July 2010 - June 2014.
- Best Paper Presentation in Mechanics Division, American Society for Engineering Education (ASEE) Annual Conference, Indianapolis, IN, June 2014.
- Outstanding Teacher Award, Dept. of Mechanical Engineering, Marquette University, 2006-2007.
- Fulbright Scholar, Weizmann Institute of Science, Rehovot, Israel, September 2001 - June 2002.

Courses Taught at Marquette University

☐ Undergraduate courses, *level*.
- Design of Machine Elements, *Jr*.
- Dynamics, *Soph*.
- Dynamics of Mechanical Systems, *Jr*.
- Fundamental of Engineering Review, *Sr*.
- Measurements and Instrumentation, *Jr*.
- Mechatronics, *Sr /Grad*.

- Special Topics: Motorcycle Dynamics, *Sr*.
- Statics and Dynamics, *Soph*.

☐ Graduate courses:
- Advanced Dynamics.
- Advanced Vibrations.
- Topics in Systems Engineering: Modeling and Simulation.

Courses Taught at Carnegie Mellon University

☐ Undergraduate courses, *level*.
- Dynamics and Vibrations, *Sr*.
- Dynamics of Physical Systems, *Jr*.
- Engineering Analysis, *Sr*.
- Engineering Design, *Sr*.
- Feedback Control Systems, *Jr*.
- Kinematics & Dynamics of Mechanisms, *Sr*.
- Manufacturing Sciences, *Sr*.

- Mechanical Engineering Seminar, *Jr*.
- Musculoskeletal Biomechanics, *Sr./Grad*.
- Numerical Methods, *Jr*.

☐ Graduate courses:
- Advanced Topics in Manufacturing.
- Modern Control Engineering.
- Multivariable Process and Nonlinear Control.

Courses Taught Elsewhere

☐ Weizmann Institute of Science, Israel (Fulbright, 2001-02)
- The Control of Motion in Biological and Robotic Systems, *Grad*.

☐ Ben-Gurion Univ., Israel (Sabbatical, 2004-05)
- Automation, *Jr*.
- Intelligent Automation Systems, *Grad*.
- Intro. to Mechanical Engineering, *Soph*.
- Robotics in Manufacturing Systems, *Grad*.

Workshops Taught

☐ "Mechatronics System Design" Workshop for Practicing Engineers
  - Modena, Italy, May 17-21, 2010, Rockwell and Tetrapak (with Craig, K. and Voglewede, P.)
  - Cincinnati, OH, Dec. 14-17, 2009, Rockwell and P&G (with Craig, K. and Voglewede, P.)
  - Milwaukee, WI, Aug. 18-20, 2008, Rockwell (with Craig, K. and Voglewede, P.)

☐ "A Unified Classical/Modern Approach for Undergraduate Control Education with Integrated Laboratory," NSF Faculty Enhancement Course
  - Georgia Institute of Technology, July 21-25, 1997 (with Dorf, R., Craig, K., Kurfess, T.)
  - Rensselaer Polytechnic Institute, June 23-27, 1997 (with Craig, K. and Kurfess, T.)

☐ "A Unified Classical/Modern Approach for Undergraduate Control Education," NSF Faculty Enhancement Course, Carnegie Mellon University, June 21-25, 1993 (with Kurfess, T.)

Professional Service
- Vice President of Education, Wisconsin Society of Professional Engineers, October 2014 - July 2015.
- Board of Editors, Advances in Engineering Monograph Series, Swets and Zeitlinger, 2003-2006.
- Publicity Chair, American Control Conference, San Diego, CA, June 1999.
- Co-chair, Education Panel of ASME Dynamic Systems & Control Division, 1997-2006.
- Technical Associate Editor, IEEE Transactions on Control Systems Technology, 1997-1999.
- Chair, History Committee, IEEE Control Systems Society, December 1993-August 1996.
- Technical Editor, ASME Applied Mechanics Reviews, June 1990-June 2004.
- Technical Associate Editor, IEEE Control Systems Magazine, Fall 1986-Summer 1994.

Patents (chronological)
1. Wholey, M.H., Nagurka, M.L., and Katz, R.S., "Method and Apparatus for Dilating Blood Vessels," U.S. Patent No. 4,723,549, February 9, 1988.
2. Nagurka, M.L. and Marklin, R.W., "Smart Trigger System," PCT/US16/27867, filed April 15, 2016.
3. Slightam, J.E., Nagurka, M.L., and Marklin, R.W., "Electrical Power Assisted Device for Controlling an Aerial Bucket with a Hydraulic Movement System," PCT/US17/50715, filed September 8, 2017.

Books (chronological)
1. Benaroya, H. and Nagurka, M.L., Mechanical Vibration: Analysis, Uncertainties, and Control, 3rd ed., CRC Press, 2010.
2. Benaroya, H., Han, S.M., and Nagurka, M., Probabilistic Models for Dynamical Systems, 2nd ed., CRC Press, 2013.
3. Benaroya, H., Nagurka, M.L., and Han, S.M., Mechanical Vibration: Analysis, Uncertainties, and Control, 4th ed., CRC Press, 2018.

Chapters in Books (chronological)
1. Kurfess, T.R. and Nagurka, M.L., "Robots and Controls," The Engineering Handbook, ed. R.C. Dorf, 2nd ed., CRC Press, 2005, pp. 176-1–176-15.
2. Nagurka, M.L., "Newton-Euler Dynamics of Robots," Robotics and Automation Handbook, ed. T.R. Kurfess, CRC Press, 2005, pp. 4-1–4-10.
3. Jenkins, H.E., Nagurka, M.L., Kurfess, T.R., "Robot Dynamics and Control," The Electrical Engineering Handbook, ed. R.C. Dorf, 3rd ed., CRC Press, 2006, pp. 14-13 – 14-37.

Papers in Refereed Journals (chronological)
1. Nagurka, M.L. and Hayes, W.C., "An Interactive Graphics Package for Calculating Cross-Sectional Properties of Complex Shapes," Journal of Biomechanics, Vol. 13, 1980, pp. 59-64.
2. Nagurka, M.L., Hedrick, J.K., and Wormley, D.N., "Curving Performance of Rail Transit Trucks," Vehicle System Dynamics, Vol. 12, No. 1-3, July 1983, pp. 18-23.
3. Hayes, W.C., Gran, J.D., Nagurka, M.L., Feldman, J.M., and Oatis, C., "Leg Motion Analysis During Gait by Multiaxial Accelerometry: Theoretical Foundations and Preliminary Validations," ASME Journal of Biomechanical Engineering, Vol. 105, August 1983, pp. 283-289.
4. Diehl, K.S., Krogh, B.H., and Nagurka, M.L., "An Interactive Control Systems Simulator," IEEE Control Systems Magazine, Vol. 6, No. 2, April 1986, pp. 20-26.
5. Yen, V. and Nagurka, M.L., "A Suboptimal Trajectory Planning Algorithm for Robotic Manipulators," ISA Transactions, Vol. 27, No. 1, 1988, pp. 51-59.
6. Dzielski, J.E. and Nagurka, M.L., "H-infinity Optimal Control for a Class of Reaction-Diffusion Equations," International Journal of Control, Vol. 47, No. 6, 1988, pp. 1947-1960.

7. Wholey, M.H., Smith, J.A.M., Godlewski, P., and Nagurka, M.L., "Recanalization of Total Arterial Occlusions with the Kensey Dynamic Angioplasty Catheter," Radiology, Vol. 172, No. 1, July 1989, pp. 95-98.

8. Nagurka, M.L. and Englert, P., "Toward an Intelligent Machine Tool for Flexible Manufacturing." Robotics and Computer-Integrated Manufacturing, Vol. 6, No. 3, 1989, pp. 229-236.

9. Nagurka, M.L. and Yen, V., "Fourier-Based Optimal Control of Nonlinear Dynamical Systems," ASME Journal of Dynamic Systems, Measurement and Control, Vol. 112, No. 1, March 1990, pp. 17-26.

10. Yen, V. and Nagurka, M.L., "A Fourier-Based Optimal Control Approach for Structural Systems," AIAA Journal of Guidance, Control, and Dynamics, Vol. 13, No. 2, March-April 1990, pp. 265-276.

11. Benaroya, H. and Nagurka, M.L., "Space Structures: Issues in Dynamics and Control," Aerospace Engineering, Vol. 3, No. 4, October 1990, pp. 251-270.

12. Yen, V. and Nagurka, M.L., "Linear Quadratic Optimal Control via Fourier-Based State Parameterization," ASME Journal of Dynamic Systems, Measurement and Control, Vol. 113, No. 2, June 1991, pp. 206-215.

13. Kurfess, T.R. and Nagurka, M.L., "Understanding the Root Locus Using Gain Plots," IEEE Control Systems Magazine, Vol. 11, No. 5, August 1991, pp. 37-40.

14. Godlewski, P., Nagurka, M., and Wholey, M., "Engineering Investigation of the Kensey Dynamic Angioplasty Catheter," Journal of Biomedical Engineering, Vol. 13, September 1991, pp. 391-398.

15. Yen, V. and Nagurka, M., "Optimal Control of Linearly Constrained Linear Systems via State Parameterization," Optimal Control Applications & Methods, Vol. 13, No. 2, April-June 1992, pp. 155-167.

16. Nagurka, M.L. and Kurfess, T.R., "Gain and Phase Margins of SISO Systems from Modified Root Locus Plots," IEEE Control Systems Magazine, Vol. 12, No. 3, June 1992, pp. 123-127.

17. Tasch, U. and Nagurka, M., "Linear Quadratic Regulator with Varying Finite Time Durations," ASME Journal of Dynamic Systems, Measurement and Control, Vol. 114, No. 3, September 1992, pp. 517-519.

18. Napolitano, R., Kulluk, H., Nagurka, M., Martukanitz, R., Dickerson, P., "Development of Knowledge-Based Systems for Aluminum Welding," AWS Welding Journal, Vol. 71, No. 12, December 1992, pp. 43-47.

19. Nagurka, M.L. and Yen, V., "Development of Linear Quadratic Control Laws Via Control Parameterization," International Journal of Systems Science, Vol. 23, No. 12, 1992, pp. 2125-2139.

20. Nagurka, M. and Wang, S., "A Chebyshev-based State Representation for Linear Quadratic Optimal Control," ASME Journal of Dynamic Systems, Measurement and Control, Vol. 115, No. 1, March 1993, pp. 1-6.

21. Kurfess, T.R. and Nagurka, M.L., "Foundations of Classical Control Theory with Reference to Eigenvalue Geometry," Journal of The Franklin Institute, Vol. 330, No. 2, March 1993, pp. 213-227.

22. Dolan, J.M., Friedman, M.B., and Nagurka, M.L., "Dynamic and Loaded Impedance Components in the Maintenance of Human Arm Posture," IEEE Transactions on Systems, Man, and Cybernetics, Vol. 23, No. 3, May/June 1993, pp. 698-709.

23. Nagurka, M.L. and Kurfess, T.R., "An Alternate Geometric Perspective on MIMO Systems" ASME Journal of Dynamic Systems, Measurement and Control, Vol. 115, No. 3, September 1993, pp. 538-543.

24. Kurfess, T.R. and Nagurka, M.L., "Geometric Links Among Classical Controls Tools," IEEE Transactions on Education, Vol. 37, No. 1, February 1994, pp. 77-83.

25. Kurfess, T.R. and Nagurka, M.L., "A Geometric Representation of Root Sensitivity," ASME Journal of Dynamic Systems, Measurement and Control, Vol. 116, No. 2, June 1994, pp. 305-309.

26. Nagurka, M.L. and Wang, S.K., "A Superconducting Maglev Vehicle/Guideway System with Preview Control. Part I: Vehicle, Guideway, and Magnet Modeling," ASME Journal of Dynamic Systems, Measurement and Control, Vol. 119, No. 4, December 1997, pp. 638-643.

27. Wang, S.K. and Nagurka, M.L., "A Superconducting Maglev Vehicle/Guideway System with Preview Control. Part II: Controller Design and System Behavior," <u>ASME Journal of Dynamic Systems, Measurement and Control</u>, Vol. 119, No. 4, December 1997, pp. 644-649.

28. Haque, I. and Nagurka, M., "Modeling and Linear Analysis of High Speed Articulated Trainsets," <u>International Journal of Vehicle Design</u>, Vol. 26, No. 2/3, 2001, pp. 249-263.

29. Nagurka, M.L., "A Simple Dynamics Experiment Based on Acoustic Emission," <u>Mechatronics</u>, Vol. 12, No. 2, 2002, pp. 229-239.

30. Ressler, K., Brucker, K., and Nagurka, M., "A Thermal Time-Constant Experiment," <u>International Journal of Engineering Education</u>, Vol. 19, No. 4, 2003, pp. 603-609.

31. Nagurka, M.L., "Aerodynamic Effects in a Dropped Ping-Pong Ball Experiment," <u>International Journal of Engineering Education</u>, Vol. 19, No. 4, 2003, pp. 623-630.

32. Yaniv, O. and Nagurka, M., "Robust PI Controller Design Satisfying Sensitivity and Uncertainty Specifications," <u>IEEE Transactions on Automatic Control</u>, Vol. 48, No. 11, November 2003, pp. 2069-2072.

33. Yaniv, O. and Nagurka, M., "Design of PID Controllers Satisfying Gain Margin and Sensitivity Constraints on a Set of Plants," <u>Automatica</u>, Vol. 40, No. 1, 2004, pp. 111-116.

34. Yen, C-W., Young, C-N., and Nagurka, M.L., "A False Acceptance Error Controlling Method for Hyperspherical Classifiers," <u>Neurocomputing</u>, Vol. 57C, 2004, pp. 295-312.

35. Yen, C-W., Young, C-N., and Nagurka, M.L., "A Vector Quantization Method for Nearest Neighbor Classifier Design in Pattern Recognition," <u>Pattern Recognition Letters</u>, Vol. 25, Issue 6, 2004, pp. 725-731.

36. Yaniv, O. and Nagurka, M., "Robust Performance Limitations of Controlled Delayed Systems," <u>ASME Journal of Dynamic Systems, Measurement and Control</u>, Vol. 126 No. 4, December 2004, pp. 899-904.

37. Yen, C-W., Young, C.N. and Nagurka, M.L., "A Training Sample Sequence Planning Method for Pattern Recognition Problems," <u>Automatica</u>, Vol. 41, Issue 4, April 2005, pp. 563-738.

38. Nagurka, M.L. and Marklin, R.M., "Measurement of Stiffness and Damping Characteristics of Computer Keyboard Keys," <u>ASME Journal of Dynamic Systems, Measurement and Control</u>, Vol. 127, June 2005, pp. 283-288.

39. Yaniv, O. and Nagurka, M., "Automatic Loop Shaping of Low-Order QFT Controllers," <u>ASME Journal of Dynamic Systems, Measurement and Control</u>, Vol. 127, September 2005, pp. 472-477.

40. Nagurka, M. and Huang, S., "A Mass-Spring-Damper Model of a Bouncing Ball," <u>International Journal of Engineering Education</u>, Vol. 22, No. 2, 2006, pp. 393-401.

41. Biess, A., Nagurka, M., and Flash, T., "Simulating Discrete and Rhythmic Multi-Joint Human Arm Movements by Optimization of Nonlinear Performance Indices," <u>Biological Cybernetics</u>, Vol. 95, No. 1, July 2006, pp. 31-53.

42. Bufton, M.J., Marklin, R.M., Nagurka, M.L. and Simoneau, G.G., "Effect of Keyswitch Design of Desktop and Notebook Keyboards Related to Key Stiffness and Typing Force," <u>Ergonomics</u>, Vol. 49, No. 10, August 2006, pp. 996-1012.

43. Young, C-N. Yen, C-W., Bau, Y-H., and Nagurka, M.L., "One-Class-At-A-Time Removal Sequence Planning Method for Multiclass Classification Problems," <u>IEEE Transactions on Neural Networks</u>, Vol. 17, Issue 6, Nov. 2006, 1544-1549.

44. Yeh, C., Wang, J-F. Wu, F-T., Yen, C-W., Nagurka, M.L. and Lin, C-L., "A Comparative Study for 2D and 3D Computer-Aided Diagnosis Methods for Solitary Pulmonary Nodules," <u>Computerized Medical Imaging and Graphics</u>, Vol. 32, 2008, pp. 270-276.

45. Wang, J-F., Lin, C-L., Yen, C-W., Chang, Y-H., Chen, T-Y., Su, K-P., and Nagurka, M.L., "Determining the Association between Dermatoglyphics and Schizophrenia by using Fingerprint Asymmetry Measures," <u>International Journal of Pattern Recognition and Artificial Intelligence</u>, Vol. 22, No. 3, 2008, pp. 601-616.

46. Wang, J-F., Lin, C-L., Chang, Y-H., Nagurka, M.L., Yen, C-W., and Yeh, C-Y., "Gender Determination using Fingerprint Features," <u>Internet Journal of Medical Update</u>, Vol. 3, No. 2, 2008, pp. 22-28.

47. Jenkins, H. and Nagurka, M.L., "Development of a Cascaded Controller for Temperature and Core Growth Rate in Vapor-Phase Axial Deposition," Proceedings of the Institution of Mechanical Engineers, Part I: Journal of Systems and Control Engineering, Vol. 223, No. 6, 2009, pp.863-875.

48. Hang, L.W., Hong, C.Y., Yen, C.W., Chang, D.J., and Nagurka, M.L., "Gait Verification using Knee Acceleration Signals," Expert Systems with Applications, Vol. 38, 2011, pp.14550-14554.

49. Theriault, A., Nagurka, M., and Johnson, M.J., "Design and Development of an Affordable Haptic Robot with Force-Feedback and Compliant Actuation to Improve Therapy for Patients with Severe Hemiparesis," IEEE Transactions on Haptics, Vol. 7, No. 2, April-June, 2014, pp.161-174.

50. Su, B.L., Luo, Y., Hong, C.Y., Nagurka, M.L., Yen, C.W., "Detecting Slow Wave Sleep Using a Single EEG Signal Channel," Journal of Neuroscience Methods, Vol. 243, March 2015, pp. 47-52.

51. Hong, C-Y, Guo, L-Y, Son, R., Nagurka, M.L., Sung, J-L, and Yen, C-W, "Assessing Postural Stability via the Correlation Patterns of Vertical Ground Reaction Force Components," BioMedical Engineering OnLine, Vol. 15, No. 90, August 2016, pp.1-18.

52. Hong, C-Y, Guo, L-Y, Son, R., Nagurka, M.L., Sung, J-L, and Yen, C-W, "Developing a Low-Cost Force Treadmill via Dynamic Modeling," Journal of Healthcare Engineering, Vol. 2017, ID 9875471, June 2017, pp.1-9.

53. Nagurka, M.L., Marklin, R.W., and Larson, N.R., "Smart Trigger: Development of a System to Improve Nail Gun Safety," Professional Safety, Vol. 62, No. 8, August 2017, pp.31-38.

Papers in Proceedings of Refereed Conferences (chronological)

1. *Nagurka, M.L. and Hayes, W.C., "An Automated Method for Characterizing Cross-Sectional Properties of Complex Shapes," Proceedings of the Seventh New England Bioengineering Conference, Troy, NY, March 22-23, 1979, pp. 114-117.

2. *Nagurka, M.L., Bell, C.E., Hedrick, J.K., and Wormley, D.N., "Computational Methods for Steady-State Curving Analyses of Rail Vehicles," Computational Methods in Ground Transportation Vehicles, ed. Kamal, M. and Wolf, J., AMD-Vol. 50, ASME Winter Annual Meeting, November 14-19, 1982, pp. 153-179.

3. *Nagurka, M.L., Hedrick, J.K., and Wormley, D.N., "Curving Performance of Rail Transit Trucks," Proceedings of the Eighth IAVSD-IUTAM Symposium on the Dynamics of Vehicles on Roads and Tracks, Cambridge, MA, August 14-19, 1983.

4. *Nagurka, M.L. and Hedrick, J.K., "Kinematic Steering Control of Rail Vehicles," Proceedings of the 1984 American Control Conference, San Diego, CA, June 6-8, 1984.

5. *Nagurka, M.L., Wormley, D.N., and Hedrick, J.K., "Dynamic Curving Performance of Rail Transit Vehicles," Technical Paper 84-WA/DSC-12, ASME Winter Annual Meeting, New Orleans, LA, December 9-14, 1984.

6. Diehl, K.S., Krogh, B.H., and Nagurka, M.L., "An Interactive Control Systems Simulator," Proceedings of the Second Symposium on Computer-Aided Control System Design, Santa Barbara, CA, March 13-15, 1985. *(Presented by videotape.)*

7. *Detwiler, P.O. and Nagurka, M.L., "Track Geometry Modeling for Rail Vehicle Studies," Dynamic Systems: Modelling and Control, ed. Donath, M., DSC-Vol. 1, ASME Winter Annual Meeting, Miami Beach, FL, November 17-22,1985, pp. 325-331.

8. *Staab, J., Nagurka, M.L., and Wall, C. III, "Progress Toward a Multiple-Input Model of the Vestibulo-Ocular Reflex," Proceedings of the Eighth Annual Conference of the IEEE Engineering in Medicine and Biology Society, Fort Worth, TX, November 7-10, 1986, pp. 928-931.

9. *Nagurka, M.L., "A Theoretical Approach for Optimal Motion Generation of a Bipedal Locomotion Model," 1986 Advances in Bioengineering, ed. Lantz, S.A. and King, A.I., BED-Vol. 2, ASME Winter Annual Meeting, Anaheim, CA, December 7-12, 1986, pp. 115-116.

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*Author presenting paper.

10. *Yen, V. and Nagurka, M.L., "A Suboptimal Control Approach for the Study of Bipedal Locomotion," Proceedings of the 13th Northeast Bioengineering Conference, *ed.* Foster, K.R., Philadelphia, PA, March 12-13, 1987, pp. 138-140.

11. Yen, V. and *Nagurka, M.L., "A Suboptimal Trajectory Planning Algorithm for Robotic Manipulators," Proceedings of ROBEXS 87, Third Annual Workshop on Robotics and Expert Systems, Pittsburgh, PA, June 4-5, 1987, pp. 129-136.

12. *Nagurka, M.L. and Yen, V., "Predicting Segment Trajectories of a Locomotion Model by a Suboptimal Control Algorithm," 1987 Biomechanics Symposium, *ed.* Butler, D.L. and Torzilli, P.A., ASME AMD-Vol. 84, Cincinnati, OH, June 14-17, 1987, pp. 361-364.

13. Yen, V. and *Nagurka, M.L., "Generating Suboptimal Trajectories of Dynamical Systems by Fourier-Based Approximations," Analysis and Control of Nonlinear Systems, *ed.* C.I. Byrnes, C.F. Martin, and R.E. Saeks, Elsevier Science Publishers, Amsterdam, 1988, pp. 187-194. (Also presented at the International Symposium on the Mathematical Theory of Networks and Systems, Phoenix, AZ, June 15-19, 1987.)

14. *Nagurka, M.L., Yen, V., and Benaroya, H., "A Fourier-Based Method for the Suboptimal Control of Nonlinear Dynamical Systems," Proceedings of the Sixth VPI&SU/AIAA Symposium on Dynamics and Control of Large Structures, Blacksburg, VA, June 29-July 1, 1987, pp. 77-88.

15. *Desa, S., Nagurka, M.L., and Ghosal, A., "Product Re-Design for Performance, Manufacture, and Assembly: A Rational Methodology towards Total System Design," Proceedings of the 1987 International Conference on Engineering Design, Vol. 1, *ed.* Eder, W.E., Boston, MA, August 17-20, 1987, pp. 463-472.

16. *Gotow, J.K., Friedman, M.B., Nagurka, M.L., and Dolan, J.M., "Perception of Mechanical Properties at the Man-Machine Interface," Proceedings of the 1987 IEEE International Conference on Systems, Man, and Cybernetics, Alexandria, VA, October 20-23, 1987, pp. 688-689.

17. *Dolan, J.M., Friedman, M.B., Nagurka, M.L., and Gotow, J.K., "A Robot in an Operating Room: A Bull in a China Shop?", Proceedings of the Ninth Annual Conference of the IEEE Engineering in Medicine and Biology Society, Vol. 2, Boston, MA, November 13-16, 1987, pp. 1096-1097.

18. Dolan, J.M., *Friedman, M.B., Nagurka, M.L., and Gotow, J.K., "Gestural Control of Industrial Robots: An Application to Surgical Instrument Positioning," Advanced Topics in Manufacturing Technology: Product Design, Bioengineering, and Space Commercialization, *ed.* Francis, P.H., ASME Winter Annual Meeting, Boston, MA, December 13-18, 1987, pp. 29-34.

19. *Nagurka, M.L. and Yen, V., "Designing Manipulator Trajectories by Nonlinear Programming," Modeling and Control of Robotic Manipulators and Manufacturing Processes, *ed.* Shoureshi, R., *et al.*, DSC-Vol. 6, ASME Winter Annual Meeting, Boston, MA, December 13-18, 1987, pp. 377-384.

20. Yen, V. and *Nagurka, M.L., "Suboptimal Trajectory Planning of a Five-Link Human Locomotion Model," Biomechanics of Normal and Prosthetic Gait, *ed.* Stein, J.L., BED-Vol. 4 and DSC-Vol. 7, ASME Winter Annual Meeting, Boston, MA, December 13-18, 1987, pp. 17-22.

21. Yen, V. and *Nagurka, M.L., "A Fourier-Based Optimal Control Approach for Structural Systems," Proceedings of the 1988 American Control Conference, Atlanta, GA, June 15-17, 1988, pp. 2082-2087.

22. Jourdain, J.M. and *Nagurka, M.L., "Environment Reconstruction and Force/Position Cycling Control of Robots in Interactive Tasks," Proceedings of the USA-Japan Symposium on Flexible Automation, Vol. 1, Minneapolis, MN, July 18-20, 1988, pp. 123-130.

23. Yen, V. and *Nagurka, M.L., "Fourier-Based State Parameterization for Linear Quadratic Optimal Control," Technical Paper 88-WA/DSC-7, ASME Winter Annual Meeting, Chicago, IL, November 27 - December 2, 1988.

24. Yen, V. and *Nagurka, M.L., "Multiple-Segment Fourier-Based Approach for Linear Quadratic Optimal Control," Proceedings of the IEEE International Conference on Control and Applications, Jerusalem, Israel, April 3-6, 1989, RP-6-8, pp. 1-6.

25. Yen, V. and *Nagurka, M.L., "Optimal Trajectory Planning of Robotic Manipulators Via Quasi-Linearization and State Parameterization," <u>Proceedings of the 1989 IEEE International Conference on Robotics and Automation</u>, Vol. 2, Scottsdale, AZ, May 14-19, 1989, pp. 1116-1121.

26. Gotow, J.K., *Friedman, M.B., and Nagurka, M.L., "Controlled Impedance Test Apparatus for Studying Human Interpretation of Kinesthetic Feedback," <u>Proceedings of the 1989 American Control Conference</u>, Pittsburgh, PA, June 21-23, 1989, pp. 332-337.

27. *Yen, V. and Nagurka, M.L., "A Control Parameterization Approach for Linear Quadratic Systems," <u>Proceedings of the 1989 American Control Conference</u>, Pittsburgh, PA, June 21-23, 1989, pp. 774-779.

28. *Wright, P.K., Demmel, J.W., and Nagurka, M.L., "The Dexterity of Manufacturing Hands," <u>Robotics Research - 1989</u>, *ed.* Youcef-Toumi, K. and Kazerooni, H., DSC-Vol. 14, ASME Winter Annual Meeting, San Francisco, CA, December 10-15, 1989, pp. 157-163.

29. Jourdain, J.M. and *Nagurka, M.L., "Environment Identification and Constraint Monitoring for Robotic Interactive Tasks," <u>Robotics Research - 1989</u>, *ed.* Youcef-Toumi, K. and Kazerooni, H., DSC Vol. 14, ASME Winter Annual Meeting, San Francisco, CA, December 10-15, 1989, pp. 189-194.

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