Neville John Hogan

Curriculum Vitae, October 2011

EDUCATION

Ph.D. in Mechanical Engineering, Massachusetts Institute of Technology, 1977
Thesis Title: Myoelectric Prosthesis Control: Optimal Estimation Applied to E.M.G. and the Cybernetic Considerations for its use in a Man-Machine Interface.
Mechanical Engineer Degree, Massachusetts Institute of Technology, 1976
M.S. in Mechanical Engineering, Massachusetts Institute of Technology, 1973
Diploma in Engineering (with distinction), College of Technology, Dublin (now Dublin Institute of Technology), Ireland, 1970

ACADEMIC POSITIONS

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
2009-present Sun Jae Professor, Department of Mechanical Engineering
1992-present Director, Newman Laboratory for Biomechanics and Human Rehabilitation
1990-present Professor, Department of Brain and Cognitive Sciences
1989-present Professor, Department of Mechanical Engineering
1985-1989 Associate Professor with tenure, Department of Mechanical Engineering
1983-1985 Associate Professor, Department of Mechanical Engineering
1979-1983 Assistant Professor, Department of Mechanical Engineering
1978-1979 Lecturer, Department of Mechanical Engineering
1978-1979 Research Associate, Department of Mechanical Engineering
1978-1979 Research Associate, Department of Psychology
1970-1976 Research Assistant, Department of Mechanical Engineering
PENNSYLVANIA STATE UNIVERSITY
2006 Visiting Professor, Department of Kinesiology

HONORS AND AWARDS

Rufus T. Oldenburger Medal, American Society of Mechanical Engineers Dynamic Systems and Control Division, 2009
Sun Jae Professor, Department of Mechanical Engineering, Massachusetts Institute of Technology, 2009-2014
Henry M. Paynter Outstanding Investigator Award, American Society of Mechanical Engineers Dynamic Systems and Control Division, 2008
Doctor Honoris Causa, Dublin Institute of Technology, 2004
Silver Medal, Royal Academy of Medicine in Ireland, 2004
Doctor Honoris Causa, University of Delft, 1997
Who's Who in Finance and Business, 2005-present
Who's Who in America, 1995-present
Who's Who in American Education, 1991-present
Who's Who in Science and Engineering, 1991-present
Who's Who in the East, 1990-present
Whitaker Health Sciences Fund Faculty Fellowship
T.R.W. Foundation Faculty Fellowship in Mechanical Engineering

PATENTS

1. "Interactive Robotic Therapist" Neville Hogan, Hermano Igo Krebs, Andre Sharon and Jain Charnnarong. Patent Number 5,466,213 issued November 14, 1995.

2. "System and Method for Medical Imaging Utilizing a Robotic Device, and Robotic Device for Use in Medical Imaging" Neville Hogan, Hermano Igo Krebs. Patent Number 5,794,621 issued August 18, 1998.
3. "Actuation System with Fluid Transmission for Interaction Control and High Force Haptics" Stephen Buerger and Neville Hogan. Patent Number 7,284,374 issued October 7, 2007.
4. "Impedance Shaping Element for a Control System" Stephen Buerger and Neville Hogan. Patent Number 7,454,909 issued November 25, 2008.
5. "Pelvis Interface" Hermano Igo Krebs, Neville Hogan and Michael Roberts. Patent Number 7,556,606 issued July 7, 2009.
6. "A Wrist Robot for Rehabilitation, Psychophysics and Haptic Interface" James Celestino, Neville Hogan, Hermano Igo Krebs, Dustin Williams. Patent Number 7,618,381 issued November 17, 2009.
7. "Method for Controlling a Dynamic System" Stephen Buerger and Neville Hogan. Patent number 7,926,269 issued April 19, 2011.
8. "Method and Apparatus for Pulse-Modulated Feedback Control" Yun-Seong Song and Neville Hogan. Patent applied for August 17, 2010.

INDUSTRIAL EXPERIENCE

1977 Product Design Engineer, Donnelly Mirrors, Ltd., Nass, Ireland
1969 Trainee Engineer, Holmens Pappersbruck A.G., Sweden
1968 Trainee Engineer, Arthur Guiness and Son, Ltd., Ireland
1967 Trainee Engineer, Coras Iompair Eireann, Teo., Eire

ACADEMIC SERVICE

Massachusetts Institute of Technology

2002 – 2005 ROTC Oversight Committee
1993 – 1998 Committee on the Use of Humans as Experimental Subjects
1992 – 1997 SeaGrant Committee

Department of Mechanical Engineering

2-11 – date Awards Committee
2011 – date Faculty Search Committee
2008 – 2009 Faculty Search Committee (chair)
2008 – date Graduate Admissions Committee
2007 – 2008 Faculty Search Committee
2007 – 2008 Research Council
2006 – 2008 Graduate Policy Committee
2006 – 2007 Faculty Search Committee
2002 – 2004 Associate Head, System Dynamics and Control Division
2000 – 2002 Graduate Admissions Committee
1997 – 2002 Designated Professor, Dynamic Systems Modeling and Control
1995 Biomechanical Engineering Faculty Search Committee
1994 Undergraduate Curriculum Development Committee
1992 Graduate Policy Committee
1992 Biomechanical Engineering Faculty Search Committee
1991 Head, System Dynamics and Control Division
1990 System Dynamics and Control Faculty Search Committee
1990 System Dynamics and Control Curriculum Review
1988 Ad Hoc System Dynamics and Control Curriculum Review

1983 Graduate Policy Committee
1983 Graduate Admissions Committee
1981 Ad Hoc System Dynamics and Control Curriculum Review

Department of Brain and Cognitive Sciences

2002 Ad Hoc Promotion Review Committee

Division of Biomedical Engineering and Environmental Health (now Biological Engineering)

1999 – 2002 Faculty Search Committee

Whitaker College of Health Sciences and Technology

1986 Fairchild Faculty Search Committee
1986 Fairchild Facilities Committee
1986 Fairchild Fellowship Committee

PROFESSIONAL SOCIETIES

American Society of Mechanical Engineers
Sigma Xi, The Scientific Research Society (former member)
American Association for the Advancement of Science
Society for Neuroscience
Society for Neural Control of Movement

PROFESSIONAL SERVICE

Technical reviews too numerous to list

1980 Bioengineering Technical Session, Co-Chairman, ASME Winter Annual Meeting
1982 Robotics Symposium Chairman, ASME Winter Annual Meeting
1983 Robotics Symposium Chairman, ASME Winter Annual Meeting
1984 Robotics Technical Session Chairman, ASME International Conference on Computers in Engineering
1985 Dynamic Systems and Control Technical Session Co-Chairman, ASME Winter Annual Meeting
1987 Technical Session Co-Chairman, American Control Conference
1988 Technical Session Co-Chairman, IEEE Conference on Robotics and Automation
1988 Workshop Chairman, Winter Conference on Brain Research
1989 Technical Session Co-Chairman, IEEE Conference on Robotics and Automation
2005 Technical Session Chairman, Progress in Motor Control V
2008 Technical Session Co-Chairman, Society of Engineering Science Annual Meeting
2008 Technical Session Co-Chairman, Dynamic Systems and Control Conference
2009 Co-organizer, Satellite Meeting, Neural Control of Movement Society Annual Meeting
2009 Co-organizer, CMMI Workshop on NeuroMechanical Engineering, National Science Foundation
2010 Co-organizer, Workshop on Rehabilitation and Therapeutic Robotics for Upper and Lower Extremity, ASME Dynamic Systems and Control Conference

Academic

1998 “Rapporteur” for “Habilitation à diriger des recherches” of Dr. Bernhard Maschke, Université de Paris-Sud, Orsay, France
2001 Visiting Committee, Department of Mechanical Engineering, Michigan State University
2002 – 2005 External Examiner, Dublin Institute of Technology, Dublin, Ireland

Editorial

2000 Guest Editor, VA Journal of Rehabilitation Research and Development

2001– 2004 Editorial Board, Journal of Motor Behavior
2004 – 2007 Editorial Board, American Journal of Physical Medicine and Rehabilitation
2005 – date Senior Editor, IEEE Transactions on Neural Systems and Rehabilitation Engineering
2008 – 2009 Contributing member, Faculty of 1000 (web-based peer evaluation system)
2009 – date Editorial Board, Journal of Motor Behavior
2009 – date Editorial Board, Journal of Healthcare Engineering

Board membership

1998 – date Interactive Motion Technologies, Inc., Board of Directors
2004 – date Advanced Mechanical Technologies, Inc., Board of Advisors
2006 – date Dublin Institute of Technology Foundation, Board of Directors

TEACHING

Codes: U: undergraduate; G: graduate; 1: First term (Fall); 2: Second term (Spring); S: Summer session; T: taught; IC: in charge.

Subject	Title	Year		Status
2.023	Dynamic Systems	1978	G(S)	IC
2.70	Introduction to Design	1978	U(1)	T
2.73	Design Projects	1979	U(2)	T
2.02	Introduction to System Dynamics	1979	U(1)	T
2.70	Introduction to Design	1979	U(1)	T
2.02	Introduction to System Dynamics	1980	U(2)	T
2.70	Introduction to Design	1980	U(1)	T
2.152	Modern Control, Theory and Applications	1981	G(2)	IC
2.04	Probability and Statistics in Mechanical Engineering	1981	U(1)	IC
2.151	Advanced System Dynamics and Control	1982	G(1)	IC
2.151	Advanced System Dynamics and Control	1983	G(2)	IC
2.151	Advanced System Dynamics and Control	1983	G(1)	IC
2.04	Probabilistic Modeling and Analysis of Engineering Systems	1984	G(2)	IC
2.151	Advanced System Dynamics and Control	1984	G(1)	IC
2.04	Probabilistic Modeling and Analysis of Engineering Systems	1985	G(2)	IC
2.141	Modeling and Simulation of Dynamic Systems	1985	G(1)	IC
2.151	Advanced System Dynamics and Control	1986	G(2)	IC
2.151	Advanced System Dynamics and Control	1987	G(1)	IC
2.151	Advanced System Dynamics and Control	1987	G(2)	IC
2.141	Modeling and Simulation of Dynamic Systems	1988	G(1)	IC
2.151	Advanced System Dynamics and Control	1988	G(2)	IC
2.141	Modeling and Simulation of Dynamic Systems	1989	G(1)	IC
2.141	Modeling and Simulation of Dynamic Systems	1990	G(1)	IC
2.151	Advanced System Dynamics and Control	1991	G(2)	IC
2.02	Introduction to System Dynamics	1991	U(1)	T
2.02	Introduction to System Dynamics	1992	U(2)	T
2.793J	Quantitative Physiology: Sensory and Motor Systems	1992	U(2)	T
2.151S	Advanced System Dynamics and Control	1992	G(S)	IC
2.141	Modeling and Simulation of Dynamic Systems	1992	G(1)	IC

2.02	Introduction to System Dynamics	1993	U(2)	T
2.793J	Quantitative Physiology: Sensory and Motor Systems	1993	U(2)	T
2.02	Introduction to System Dynamics	1994	U(1)	T
2.793J	Quantitative Physiology: Sensory and Motor Systems	1994	U(2)	T
2.141	Modeling and Simulation of Dynamic Systems	1994	G(1)	IC
2.793J	Quantitative Physiology: Sensory and Motor Systems	1995	U(2)	T
2.997	Biomechanics and Neural Control of Movement	1995	G(2)	IC
2.151	Advanced System Dynamics and Control	1995	G(1)	T
2.14	Control System Principles	1996	U(2)	IC
2.793J	Quantitative Physiology: Sensory and Motor Systems	1996	U(2)	T
2.141	Modeling and Simulation of Dynamic Systems	1996	G(1)	IC
2.151	Advanced System Dynamics and Control	1997	G(2)	T
2.183	Biomechanics and Neural Control of Movement	1997	G(2)	IC
2.004J	Systems, Modeling and Control II	1997	U(1)	T
2.003	Systems, Modeling and Control I	1998	U(2)	T
2.003	System Dynamics and Modeling I	1999	U(1)	IC
2.004J	Systems Modeling and Dynamics II	2000	U(2)	IC
2.010	Systems Modeling and Dynamics III	2000	U(1)	IC
2.003	Modeling Dynamics and Control I	2001	U(1)	T
2.004	Modeling Dynamics and Control II	2002	U(2)	T
2.141	Modeling and Simulation of Dynamic Systems	2002	G(1)	IC
2.183	Biomechanics and Neural Control of Movement	2003	G(2)	IC
2.151	Advanced System Dynamics and Control	2003	G(1)	IC
2.183	Biomechanics and Neural Control of Movement	2004	G(2)	IC
2.003	System Dynamics and Modeling I	2004	U(2)	T
2.183	Biomechanics and Neural Control of Movement	2005	G(2)	IC
2.141	Modeling and Simulation of Dynamic Systems	2006	G(1)	IC
2.183	Biomechanics and Neural Control of Movement	2007	G(2)	IC
2.151	Advanced System Dynamics and Control	2007	G(1)	IC
2.183	Biomechanics and Neural Control of Movement	2008	G(2)	IC
2.994	Biomechanics and Neural Control of Movement	2008	U(2)	IC
2.671	Measurement and Instrumentation	2008	U(1)	T
2.183	Biomechanics and Neural Control of Movement	2009	G(2)	IC
2.184	Biomechanics and Neural Control of Movement	2009	U(2)	IC
2.151	Advanced System Dynamics and Control	2009	G(1)	T
2.183	Biomechanics and Neural Control of Movement	2010	G(2)	IC
2.184	Biomechanics and Neural Control of Movement	2010	U(2)	IC
2.141	Modeling and Simulation of Dynamic Systems	2010	G(1)	IC
2.151	Advanced System Dynamics and Control	2010	G(1)	T
2.183	Biomechanics and Neural Control of Movement	2011	G(2)	IC
2.184	Biomechanics and Neural Control of Movement	2011	U(2)	IC
2.151	Advanced System Dynamics and Control	2011	G(1)	IC

THESES SUPERVISED

S.B. Theses

1. Tong, Jason Ju-Chuan, "A Compliant Wrist Prosthesis", May 1979.

2. Ettelson, Steven Karl, "Design and Construction of a Prototype Thrower for a "Frisbee" Disc Throwing Machine, May 1980.
3. Hernandez, Edward, "A Catcher for a "Frisbee" Disc Throwing Machine", May 1980.
4. Kaus, David Luvern, "An Investigation of Myoelectric Activity and Muscle Generated under Isotonic and Nonisotonic Conditions", June 1980.
5. Justessen, Perry John Ingvard, "Design and Construction of a Two-Degree of Freedom Position Control Manipulator with Variable Drive Impedance", May 1981.
6. Psyhojos, George A., "Design and Construction of a Heel Actuated Bass Drum Pedal", May 1981.
7. Andrews, J. Randolph, "Douloi Systems: Design and Construction of a Manipulator and Controller for Research in Impedance Control", May 1981.
8. White, Richard Putnam, "A Capstan Bicycle Brake", June 1981.
9. Crane, Robert W., "The Design and Assembly of a Compliant Robot Arm", June 1981.
10. Hamilton, Patrick, "A Microprocessor Implemented Myoelectric Signal Processor", June 1981.
11. Colgate, James Edward, "The Design of a Robotic Gripper Capable of Repositioning Objects Within its Grasp", May 1983 (Department of Physics).
12. Holden, Raymond L., "A Dynamic Model of the Utah Arm", September 1983.
13. Novash, Walter, "Performance Characterization of a Computer-Controlled Manipulator", September 1983.
14. Vogeli, Peter Rudolf, " A Multifeatured Body-Powered Upper Extremity Terminal Device with a Compliant Wrist", May, 1985.
15. Braufman, Brad Louis, "A Robot-Mounted Tool for Wire-Handling Assembly Operations", August, 1985.
16. Choudhary, Sanjeev, "The Development of a Quiet Parts Ejection Nozzle for Use on A Dynamics Measuring Device", June 1986.
17. Meer, David, "Design Considerations for Improving the Control of a Dynamics Measuring Device", May 1987.
18. Tseng, Angela, "Investigation of Unrestrained Spatial Arm Movements in Humans", June 1987.
19. Kim, Richard, N., "The Analysis of Noise Measurements on Potential Ejection Nozzle Designs for Use on a Dynamic Measuring Device", May 1989.
20. Huang, Sherman S.-M. "Improving Control Instrumentation for a Dynamics Measuring Device", September 1989.
21. Fox, Shari, "Real-Time Digital Electromyographic Signal Processing", June 1992.
22. Gomez, Steve Rodriguez, “Evaluating the mechanical impedance of a novel electro-mechanical actuator”, February 1993
23. Bergeron, Kathleen A., "The Design Motives and Processes for a Portable Finger Goniometer and Data Logger", June 1993.
24. Mehta, Neil R. "The Variable Impedance Actuator - Stability Characteristics and Interesting Applications", May 1994
25. Minekime, Christopher M., "Friction Mapping in the Workspace of an Occupational Therapy Robot", May 1994
26. Darley, Jesse, "A Quantitative Analysis of Active Isolated and Static Stretching Techniques", June 1995.
27. Saini, Meera, "The Vertical Displacement of the Center of Mass of the Human Body During Walking: A Comparison of Four Measurement Methods", June 1995.

28. Scott, Donna L., "Design and Fabrication of a Human-Machine Interface for Upper Limb Physical Therapy", June 1995.
29. Oppold, Paul, "Quadrature Wave Decoding in the Implementation of an Incremental Encoder", 1997
30. Kim, Euna, "Safety Card for Robotic Arm used in Rehabilitation Therapy", 1997.
31. Evans, Robin C., "Method for the Acquisition and Analysis of the Gait Pattern of Stroke Victims", 1999.
32. Verdirame, Justin Matthew, "Characterization of a Hydraulic Actuator for a Functional Magnetic Resonance Imaging Robot", 2000.
33. Chan, Albert, "Design of Apparatus to Test Effects of Backlash on Force Feedback Systems", 2001.
34. Faiz, Jeehan, "Redesign of Human/Robot Interface for A Three Degree of Freedom Therapy Robot", 2001.
35. Zimmerman, Julia C., “Kinematic Study of Human Ankle Control During Walking”, June 2009
36. Mayalu, Michaëlle Ntala, “Electromechanical Design of a Body Weight Support System for a Therapeutic Robot for Rodent Studies”, June 2010
37. Tao, Gregory Daniel, “Mechanical Bracing Solutions to Decrease Tibial Slippage of Anklebot”, June 2010
38. Wiltsie, Nicholas Eric, “Characterization of a Series Viscous Actuator For Use in Rehabilitative Robotics”, June 2010
39. Blackburn, Bonnie Lucille, “Lower Limb Response to Modified Ankle Impedance in Gait”, June 2011

S.M. Theses

1. Deming, Loretta Mary, "Digital Self-Calibrating Myoprocessor", May 1980.
2. Lawrence, John Heyer III, "The Myoelectric Signal Versus Force Relationship in Different Human Muscles", May 1981.
3. Cunningham, Elizabeth Ann, "Effect of Tissue Layers on the Myoelectric Signal", June 1981.
4. Abul-Haj, Cary James, "The Design of an Upper-Arm Prosthesis Simulator with Variable Mechanical Impedance", September 1981.
5. Cotter, Sheila Lorraine, "Nonlinear Feedback Control of Manipulator Endpoint Impedance", July 1982.
6. Peterman, Teresa Gayle, "A CAD Compatible Method of Planning an Automated Assembly Task", December 1982.
7. Andrews, J. Randolph, "Impedance Control as a Framework for Implementing Obstacle Avoidance in a Manipulator", January 1983.
8. Kleidon, Mark, "Modeling and Performance of a Pneumatic/Hydraulic Hybrid Actuator with Tunable Mechanical Impedance", September 1983.
9. Moore, Steven R., "Part-Referenced Manipulation: Applications for a Drilling Operation", May 1983.
10. Park, Jong, "Robotic Assembly: In-Process Estimation of Bolt Tension", August 1983.
11. Taylor, Richard Dirk, "Design of an Automated Bolting Tool for Use with a Robotic Manipulator", August 1983.
12. Doerré, Mark, "Implementation of an Impedance Control Algorithm on an Admittance Causality Manipulator", August 1984.

13. Dean, David L. Jr., "Design of a Robotic End Effector for Automated Bolting", May 1985.
14. Colgate, James E. "The Design of a Dynamics Measuring Device", January 1986.
15. Wlassich, John J., "Nonlinear Force Feedback Impedance Control", January 1986.
16. Faye, Ian C., "An Impedance Controlled Mechanism for Studying Human Arm Movements", June 1986.
17. Miller, Crispin Mount, "A Method for Assessing the Importance of Elbow Dynamic Behavior in Manual Tasks", January 1987.
18. Fasse, Ernest Dean, "Stability Robustness of Impedance Controlled Manipulators Coupled to Passive Environments", June 1987.
19. Mansfield, John M., "The Design of a Lightweight Elbow Prosthesis Emulator", May 1988.
20. Russell, Donald L., "Arm Motion in Crank Turning", May 1988.
21. Sharon, Simon, "Stability/Performance Trade-Offs for Computer Controlled Manipulators", May 1988.
22. Blok, Johannes, "The Use of an Electrode Array for the Dataselection in EMG Analysis", May 1988.*
23. Maier, Patricia, "Simulation and Control of a Robotic Manipulator", May 1989.
24. Jonas, Jason, "Closed Loop Control of a Hydraulic High-Rate Testing Machine", May 1989.
25. Charrarong, Jain, "The Design of an Intelligent Machine for Upper-Limb Physical Therapy", 1991.
26. Doeringer, Joseph A., "A Quantitative Assessment of Body-Powered Above Elbow Arm Prostheses", February 1993.
27. Won, Justin, "The Control of Constrained and Partially Constrained Arm Motions in Humans", January 1993.
28. Wangpattanasirikul, Suthipong, “Port-based System Identification”, September 1996.
29. Wilkenfeld, Ari, “Computer Simulation of the neuromuscular reaction to electrical stimulation of the spinal cord of a spinalized frog.”, February 1997 (Department of Electrical Engineering and Computer Science).
30. Adebiyi, Debo, “Fabrication and Characterization of Beta-Prototype MIT-Manus: an Intelligent Machine for Upper-Limb Physical Therapy”, February 1998.
31. Rohrer, Brandon R. “Study of Adaptation in Amputees”, February 1999.
32. Foster, Craig, “A Performance Characterization of an Interactive Robot”, September 1999.
33. Berniker, Max, “A Biologically Motivated Paradigm for Heuristic Motor Control in Multiple Contexts”, September 2000.
34. Jugenheimer, Kristin Anne, “A Robot for Hand Rehabilitation”, February 2001.
35. Buerger, Stephen Paul, “Characterization and Control of an Interactive Robot”, February 2001.
36. Williams, Dustin, “A Robot for Wrist Rehabilitation”, June 2001.
37. Tang, Philip H., "Characterization of a Robot Designed for Hand Rehabilitation", 2002.
38. Celestino, James R. “Characterization and Control of a Robot for Wrist Rehabilitation”, June 2003.
39. Bowers, Thomas A. “Modeling, Simulation and Control of a Polypyrrole-Based Conducting Polymer Actuator”, January 2004

* Master of Science in Mechanical Engineering at the Delft University of Technology, Netherlands

40. Eastman, Douglas E. IV, "Design of Semi-active Variable Impedance Materials Using Field-Responsive Fluids", June 2004
41. Rhyou, Chanryeol, "Finite Element Simulation of Electrorheological Fluids", February 2005
42. Griffin, Ryan A., "Variable Impedance Energy Dissipation on the Micro-Scale: Field Responsive Fluids in Novel Geometries", June 2006
43. Ahn, Jooeun, "Analysis of Walking and Balancing Models Actuated and Controlled by Ankles", September 2006
44. Ho, Patrick, "The Measurement and Interpretation of Actively Modulated Static Ankle Impedance using a Therapeutic Robot", June 2010
45. Klenk, Daniel, "Phase Resetting of Human Walking", September 2011
46. Wang, Victor, "Bimanual Cross-Coupling in Space Telerobotics", February 2012

S.M. Theses, Reader

1. Abramowitz, Jeffrey David, "Design and Control of a Redundant Mechanism for Small Endpoint Motion", 1983.
2. Sharon, André, "Enhancement of Robot Accuracy Using a Macro/Micro Manipulator System", 1983.
3. Kishinchandani, Rita S., "Quantitative Assessment of Above-elbow Prosthetic Control", 1991 (Massachusetts General Hospital Institute of Health Professions)
4. Smits, Matthijs, "Analysis and Recognition of Myoelectric Activity During Fast Arm Movements as Part of the Control of Prostheses", 1991 (University of Delft)
5. Al-Nahwi, Ammar Adnan, "Modeling of Industrial Pumping System Dynamics", 1996.
6. Smith, Eric D., "Robotic Compensation of Cerebellar Ataxia", (Department of Mechanical Engineering and Department of Electrical Engineering and Computer Science), 2007

Doctoral Theses, Supervisor

1. Delatizky, Jonathan, "Final Position Control in Simulated Planar Horizontal Arm Movements", August 1982 (Department of Electrical Engineering and Computer Science).
2. Abul-Haj, Cary J., "Elbow Prosthesis Emulation: A Technique for the Quantitative Assessment of an Assistive Device", June 1987.
3. Newman, Wyatt S., "High-Speed Robot Control in Complex Environments", October 1987.
4. Murray, William R., "Essential Factors in Modeling the Modulation of Impedance about the Human Elbow", May 1988.
5. Colgate, James E., "The Control of Dynamically Interacting Systems", August 1988.
6. Sharon, André, "The Macro/Micro Manipulator: An Alternative Robot Architecture", Ph.D., September 1988.
7. Russell, Donald L., "An Analysis of Constrained Motions in Manipulation", September 1990.
8. Clancy, Edward A., "Stochastic Modeling of the Relationship between the Surface Electromyogram and Muscle Torque", January 1991 (Department of Electrical Engineering and Computer Science).
9. Fasse, Ernest D., "On the Use and Representation of Sensory Information by Robots and Humans", September 1992.
10. Mansfield, John M., "Functional Assessment of Amputee Performance", December 1992.

11. Hodgson, Antony J., "Inferring Central Motor Plans from Attractor Trajectory Measurements", July 1994 (Harvard-MIT Division of Health Sciences and Technology).
12. Rancourt, Denis, "Arm Posture and Hand Mechanical Impedance in the Control of a Power Drill", January 1995.
13. Miller, Crispin Mount, "—So Can You Build One? Learning Through Designing: connecting theory with hardware in engineering education", May 1995.
14. Krebs, Hermano I., "Robot-Aided Neuro-Rehabilitation and Functional Imaging", January 1997 (Department of Ocean Engineering).
15. Srikrishna, Padmanabhan, "Preventive Stepping in Quiet Standing: Effect of Vestibulopathy.", May 1997.
16. Doeringer, Joseph A., "An Investigation into the Discrete Nature of Human Arm Movements", February 1999.
17. Won, Justin, "Analyzing Physical System Interaction", September 1999.
18. Rohrer, Brandon Robinson, "Evolution of Movement Smoothness and Submovement Patterns in Persons With Stroke", 2002.
19. Buerger, Stephen P., "Stable, High-Force, Low-Impedance Robotic Actuators for Human-Interactive Machines", February 2005.
20. Palazzolo, Jerome J., "Performance-Based Progressive Robot Training to Assist Motor Recovery and Motor Learning", June 2005.
21. Charles, Steven K., "It's All in the Wrist: A Quantitative Characterization of Human Wrist Control", September 2008 (Harvard-MIT Division of Health Sciences and Technology).
22. Ahn, Jooeun, "Feasibility of Novel Gait Training with Robotic Assistance: Dynamic Entrainment to Mechanical Perturbation to the Ankle" June 2011.
23. Song, Yun-Seong, expected May 2012
24. Lee, Hyunglae, expected January 2013

Doctoral Theses, Reader

1. Lanman, Jeremy Malcolm, "Movement and the Mechanical Properties of the Intact Human Elbow Joint", June 1980 (Department of Psychology).
2. Mason, Matthew Thomas, "Manipulator Grasping and Pushing Operations", June 1982 (Department of Electrical Engineering and Computer Science).
3. Yoerger, Dana R., "Supervisory Control of Underwater Telemanipulators: Design and Experiment", August 1982.
4. Stein, Jeffrey Llevrett, "Stance Phase Knee Controller Design Methodology for Above-Knee Prostheses", December 1982.
5. Mambrito, Bruno, "Motor Unit Interaction within a Muscle and among Antagonist Muscles in Humans", December 1983.
6. Flash, Tamar, "Organizing Principles Underlying the Formation of Arm Trajectories", May 1983 (Harvard-M.I.T. Division of Health Science and Technology).
7. Durfee, William K., "Task Control with an Electrically Stimulated Antagonist Muscle Pair", May 1985.
8. Kazerooni, Homayoon, "A Robust Design Method for Impedance Control of Constrained Dynamic Systems", February 1985.
9. Ladin, Zvi, "Dynamic Stability of Amputee Gait", August 1985.
10. Youcef-Toumi, Kamal, "Analysis, Design and Control of Direct-Drive Manipulators", May 1985.

11. Atkeson, Christopher G., "Roles of Knowledge in Motor Learning", September 1986 (Department of Brain and Cognitive Sciences).
12. Pabon, Jahir, "A Neural Network Model of Adaptation in Motor Coordination", April 1988.
13. Raju, Jagannath, "Feasibility of Operator Adjustable Impedance in Remote Manipulation", September 1988
14. Murphy, Michael C., "Kinematics and Dynamics of the Human Knee Joint", January 1989.
15. Adelstein, Bernard D., “A Virtual Environmental System For the Study of Human Arm Tremor”, January 1989.
16. Hale, Michael Bruce, "Multivariable Geometry Control of Gas Metal Arc Welding", January 1989.
17. Burke, Shawn, "Spatial Elements of Distributed Parameter Control", May 1989.
18. McIntyre, Joseph, "The Role of Reflex in Motor Control", May 1989 (Department of Brain and Cognitive Sciences).
19. Schempf, Hagen, "Comparative Design, Modeling, and Control Analysis of Robotic Transmissions", 1990.
20. Bennett, David J., "The Control of Human Arm Movement: Models and Mechanical Constraints", 1990 (Department of Brain and Cognitive Sciences).
21. Fijan, Robert Scott, "A Three-Dimensional Mathematical Model of the Human Knee Joint", 1990.
22. Alirand, Marc, "ETUDE PAR LES BOND GRAPHS D'UNE SUSPENSION CITROEN ET CONCEPTION D'UNE SUSPENSION A CORRECTION D'ASSIETTE ACTIVE", January 1991 (Université Claude Bernard, Lyons, France)
23. Bedrossian, Nazareth S., “Nonlinear Control Using Linearizing Transformations”, September 1991.
24. Amsterdam, Jonathan, "Automated Qualitative Modeling of Dynamic Physical Systems", January 1993 (Department of Electrical Engineering and Computer Science).
25. Wu, Shang-Teh, "Input/Output Linearization of Uncertain Systems with Time-Delay Control", February 1993.
26. van Dijk, Johannes, "On the role of bond graph causality in modeling mechatronic systems", February 1994 (University of Twente, Netherlands)
27. de Vries, Theo J. A., "Conceptual design of controlled electro-mechanical systems", February 1994 (University of Twente, Netherlands)
28. Lord, Patrick J., "Computer Aided Intertrochanteric Osteotomy Planning and Surgery Simulation", May 1994.
29. Kumar, Cheruvu Siva, "Shaping the Interaction Behaviour of Manipulators through Additional Passive Degrees of Freedom: A New Approach to Impedance Control", July 1994 (Indian Institute of Technology, West Bengal, India)
30. Abushanab, Heather L. Beck, "Muscle Modeling and Parameterization For Use In Control Via Electric Stimulation", 1995.
31. Wlassich, John J., "A Method to Predict Transitions in Material Behavior", 1995.
32. Palmer, Karen I., "Time-Frequency Variations in Cerebellar Intention Tremor and Prediction of Drug Response from Limb Loading Results", 1995.
33. Love, Lonnie Joe, "Adaptive Impedance Control", 1995 (Georgia Institute of Technology)
34. Dandekar, Kiran, “Role of mechanics in tactile sensing of shape”, 1995

35. Gandolfo, Francesca, "The Role of Motor Primitives in the Control of Movement and Learning", 1996.
36. Patrick, Nicolas J.M., "Decision-Aiding and Optimization for Vertical Navigation of Long-Haul Aircraft", 1996.
37. Sabes, Philip N., "The Planning of Visually Guided Arm Movements: Feedback Perturbation and Obstacle Avoidance Studies", 1996.
38. Lee, Woojin, "Polymer Gel Based Actuator: Dynamic model of gel for real time control", 1996.
39. Huang, Shih-Ying, "Structural Analysis from System Configurations for Modeling and Design of Multi-Energy Domain Dynamic Systems", 1997.
40. Jackson, Dana Kessler, "Development of Full-Body Models for Human Jump Landing Dynamics and Control", June 1997 (Department of Aeronautics and Astronautics).
41. Rosen, Jacob, "Natural Integration of a Human Arm/Powered Exoskeleton System", 1997 (Tel Aviv University, Israel)
42. Stramigioli, Stefano, "From Differentiable Manifolds to Interactive Robot Control", 1998. (University of Delft, Netherlands)
43. English, Chad, “Stiffness Behaviour in Two Degree of Freedom Mechanisms”, 2000 (Carleton University, Canada)
44. Ye, Yong, "Model reduction in physical domain", 2002
45. Duignan, Barry, "Optimised Trajectory Control of Redundant Robotic Manipulators", 2001 (University College, Dublin, Ireland)
46. Golo, Goran, “Interconnection Structures in Port-Based Modeling: Tools for Analysis and Simulation” 2002 (University of Twente, Netherlands)
47. Kurtzer, Isaac L. “Dissociating Two Basic Representations for Adapting to a Dynamic Force Perturbation” May 2003 (Neuroscience Program, Brandeis University)
48. Morris, Stacy J., “A Shoe-Integrated Sensor System for Wireless Gait Analysis and Real-Time Therapeutic Feedback” June 2004 (Harvard/MIT Division of Health Sciences & Technology)
49. Franklin, David W. “Mechanisms of Adaptive Motor Control” September 2004 (Simon Fraser University, Canada)
50. Kim, Hyun K., “Strategies for Control of Neuroprostheses through Brain-Machine Interfaces” September 2005
51. Berniker, Max, “Linearity, motor primitives and low-dimensionality in the spinal organization of motor control.” September 2005
52. Farahat, Waleed, A., “The Effect of Co-activation on Workloop Energetics of Antagonist Muscles”, April 2007
53. Khanicheh, Azadeh, “Magnetic Resonance Compatible Smart Hand Rehabilitation Device for fMRI Brain Mapping” July 2007 (Departments of Mechanical and Industrial Engineering, Northeastern University)
54. Bettin, Giorgia, “High Deformation Rate Behavior of Polymeric Foams Filled with Concentrated Silica Suspensions” August 2007
55. Damm, Loic, “Modulation de l'impédance du bras: stratégies et mécanismes” (Modulation of Arm Impedance: Strategies and Mechanisms. Department of Neurosciences, Universite Pierre et Marie Curie, Paris) July 2008
55. Byl, Katie, “Metastable Legged-Robot Locomotion”, August 2008
56. Odhner, Lael, “Stochastic Recruitment Strategies for Controlling Artificial Muscles”, August 2009

57. Zhao, Yong, “Identification of ankle joint stiffness using subspace methods” Department of Biomedical Engineering, McGill University, October 2009
58. Ludvig, Daniel, “ Task-Dependent Modulation of Joint Stiffness” Department of Biomedical Engineering, McGill University, July 2010
59. Clanton, Samuel T., “Brain-Computer Interface Control of an Anthropomorphic Robotic Arm” August 2011 (Carnegie Mellon University, Robotics Institute).
60. Tin, Chung, expected June 2011 (Harvard-MIT Division of Health Sciences and Technology).

POST-DOCTORAL FELLOWS

Kay, Bruce Alan, Ph.D.
Abul-Haj, Cary J., Ph.D.
Clancy, Edward A., Ph.D
Fasse, Ernest D., Ph.D.
Mansfield, John M., Ph.D.
Michel A. Lemay, Ph.D.
Hermano I. Krebs, Ph.D.
Susan E. Fasoli, Ph.D.
Belle Kuo, Ph.D.
Laura DiPietro, Ph.D.
Stephen P. Buerger, Ph.D.
Jerome J. Palazzolo, Ph.D.
Steven K. Charles, Ph.D.
Mohammad A. Rastgaar, Ph.D.
Jooeun Ahn, Ph.D.

VISITORS

James Butler, Dublin Institute of Technology, Ireland	1987
Michael Pender, Dublin Institute of Technology, Ireland	1988
Paul Cassidy, Dublin Institute of Technology, Ireland	1988
Patrick J. E. Royer, SNECMA, France	1990
Matthijs Smits, University of Delft, Netherlands	1991
Christian Masson, Conservatoire National des Arts et Métiers, Paris, France	1992
Arjan van Dorsten, University of Twente, Netherlands	1994
Stefano Stramigioli, University of Delft, Netherlands	1997
Laura DiPietro, University of Pisa, Italy	2002
Toshiaki Tanaka, Sapporo Medical University, Japan	2003
Rebecca Beck, University College, Dublin	2004
Lorenzo Masia, University of Rome “La Sapienza”, Italy	2005
Niek Rijnveld, University of Delft, Netherlands	2006
Lucca Lonini, Università Campus Bio-Medico, Roma, Italy	2007
Emilio Gonzalez-Galvan, University of San Luis Potosi, Mexico	2007
Alejandro Fernández-Villaverde, University of Vigo, Spain	2009

PUBLICATIONS

1. Hogan, N. (1974) *An Evaluation of E.M.G. as a Proportional Control Signal*, proceedings of the 2nd Annual New England Bioengineering Conference.

2. Hogan, N. and Mann, R. W. (1974) *Detrimental Effects of Low-Frequency Noise in Proportional E.M.G. Controllers*, proceedings of the 27th Annual Conference on Engineering in Medicine and Biology.
3. Hogan, N. and Mann, R. W. (1974) *Limitations of Existing Proportional E.M.G. Processor*, proceedings of the 1974 Conference on Engineering Devices in Rehabilitation.
4. Hogan, N. (1976) *A Review of the Methods of Processing EMG for Use as a Proportional Control Signal*, Biomedical Engineering, Vol. 11, pp. 81-86.
5. Hogan, N. and Mann, R. W. (1977) *Cybernetic Considerations in the Use of Myoelectric Activity for Prosthesis Control*, presented at the ASME Winter Annual Meeting.
6. Hogan, N. (1979) *Adaptive Stiffness Control in Human Movement*, pp. 53-54 in M. K. Wells (ed.), 1979 Advances in Bioengineering, ASME.
7. Hogan, N. (1979) *Improvements in Myoelectric Controllers for Assistive Devices*, Interagency Conference on Rehabilitation Engineering.
8. Hogan, N. and Mann, R. W. (1979) *A Factor-of-Five Improvement in Myoelectric Signal Processing*, 4th Congress of the International Society for Electrophysiological Kinesiology.
9. Hogan, N. and Mann, R. W. (1979) *An Improved Myoelectric Signal Processor*, pp. 27-30 in M. K. Wells (ed.), 1979 Advances in Bioengineering, ASME.
10. Hogan, N. and Mann, R. W. (1979) *Neurophysiological Feedback from Extremities*, Bulletin of Prosthetics Research, Vol. 18, No. 2, p. 228.
11. Hogan, N. (1980) *Mechanical Impedance Control in Assistive Devices and Manipulators*, proceedings of the IEEE Joint Automatic Controls Conference, Vol. 1, paper TA-10-B.
12. Hogan, N. (1980) *The Role of Antagonist Co-activation in the Control of Natural Movement*, proceedings of the 16th Annual Conference on Manual Control, pp. 571-583.
13. Hogan, N. (1980) *Tuning Muscle Stiffness Can Simplify Control of Natural Movement*, pp. 279-282 in V C. Mow (ed.), 1980 Advances in Bioengineering, ASME.
14. Hogan, N. and Mann, R. W. (1980) *Myoelectric Signal Processing: Optimal Estimation Applied to Electromyography - Part I: Derivation of the Optimal Myoprocessor*, IEEE Transactions on Biomedical Engineering, Vol. BME-27, No. 7, pp. 382-345.
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17. Bizzi, E., Accornero, N., Chapple, W. and Hogan, N. (1981) *Central and Peripheral Mechanisms in Motor Control*, pp. 23-24 in R.A. Thompson and J.R. Green (eds.), New Perspectives in Cerebral Localization, Raven Press, New York.
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20. Cunningham, E. A. and Hogan, N. (1981) *Effects of Tissue Layers on the Surface Myoelectric Signal*, IEEE Conference on Frontiers of Engineering Health Care.
21. Hogan, N. (1981) *Impedance Control of a Robotic Manipulator*, presented at the ASME Winter Annual Meeting.

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23. Bizzi, E., Chapple, W. and Hogan, N. (1982) *Mechanical Properties of Muscles: Implications for Motor Control,* Trends in Neuroscience, Vol. 5, No. 11, pp. 395-398.
24. Flash, T. and Hogan, N. (1982) *Evidence for an Optimization Strategy in Arm Trajectory Formation,* presented at the 12th Annual Meeting of the Society for Neuroscience.
25. Hogan, N. (1982) *An Optimal Processor for the Electrical Activity of Muscle,* presented at 35th Annual Conference on Engineering in Medicine and Biology.
26. Hogan, N. (1982) *Biomedical Engineering*, pp. 275-278 in McGraw-Hill Encyclopedia of Science and Technology.
27. Hogan, N. (1982) *Control and Coordination of Voluntary Arm Movement*, proceedings of the IEEE American Control Conference, Vol. 2, pp. 522-527.
28. Hogan, N. (1982) *Moving with Control: Using Control Theory to Understand Motor Behavior* (commentary on article by R.B. Stein entitled "What Muscle Variable(s) Does the Nervous System Control in Limb Movements?"), The Behavioral and Brain Sciences, Vol. 5, No. 4, pp. 550.
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81. Hogan, N. (1987) *On the Stability of Manipulators Performing Contact Tasks*, proceedings of the Conference on Applied Motion Control, pp. 131-138.
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85. Hogan, N., Bizzi, E., Mussa-Ivaldi, F. A. and Flash, T. (1987) *Controlling Multi-Joint Motor Behavior*, Exercise and Sport Sciences Reviews, Vol. 15, pp. 153-189.
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101. Fasse, E. D. and Hogan, N. (1989) *Coupled Stability of Impedance-Controlled Robots.* pp. 5-11 in K. Youcef-Toumi and H. Kazerooni (eds.) Robotics Research ASME, New York.
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