DR. DAVID WANG

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Research Interests

Robotics, Flexible Manipulators, Linear Multivariable Control, Nonlinear Systems, Shape Memory Alloys, Hysteretic Systems, Virtual Reality Haptic Interfaces, Autonomous UAVs

EDUCATION

-Ph.D., (Electrical Engineering), University of Waterloo, 1986 to 1989
Thesis title: Modelling and Control of Multi-Link Manipulators with One Flexible Link
(Supervisor: Dr. M. Vidyasagar). Faculty of Engineering Best Ph.D. Thesis Award

-M.A.Sc., (Electrical Engineering), University of Waterloo, 1984 to 1986
Thesis title: Modelling and Control of a Flexible Beam Using the Stable Factorization Approach (Supervisor: Dr. M. Vidyasagar)

-B.E., (Engineering Physics), University of Saskatchewan, 1980 to 1984

SCHOLARSHIPS AND AWARDS

1. Nominated for Distinguished Teacher Award, University of Waterloo, 1995

2. Finalist for Best Conference Paper at the *IEEE Conference on Robotics and Automation* in 1994 (San Diego, CA) for the paper "Issues in the Design of Passive Controllers for Flexible Link Robots" coauthored by M. Rossi and K. Zuo

3. Faculty of Engineering Outstanding Ph.D Award, University of Waterloo, 1989. Awarded to the top graduating Ph.D. student in the Faculty of Engineering

4. Engineering Academic Award, University of Saskatchewan, 1984. Awarded to top graduating student in the College of Engineering

5. Engineering Leadership Award, University of Saskatchewan, 1984. Awarded to the graduating student in the College of Engineering who best combines academics and leadership qualities

6. E.L. Harrington Prize in Physics, University of Saskatchewan, 1984, Awarded to the top student graduating with a Physics or Engineering Physics Degree

7. W.R. Buck Staples Award, University of Saskatchewan, 1982 and 1983. Awarded to the top student in 1st, 2nd and 3rd year combined in the College of Engineering

8. University of Saskatchewan Entrance Scholarship, University of Saskatchewan, 1980. Awarded to the top 13 students entering 1st year university, regardless of faculty.

9. Governor-General's Bronze Medal, Saskatoon, Saskatchewan, 1980. Awarded to the top high school students in Canada who best combine academic and leadership qualities.

WORK EXPERIENCE

1. Founder and President, Handshake Interactive Technologies, 2001 to 2003

2. Associate Chair of Graduate Studies, Department of Electrical and Computer Engineering, 1998-2000

3. Full Professor, Department of Electrical and Computer Engineering, University of Waterloo, 1999-present

4.Associate Professor, Department of Electrical and Computer Engineering, University of Waterloo, 1994-1999

5. Assistant Professor, Department of Electrical and Computer Engineering, University of Waterloo, 1990-1994

6. Research Assistant Professor, Department of Electrical and Computer Engineering, University of Waterloo, 1989-1990

PUBLICATIONS
(Graduate students whom I have supervised are in italics or BOLD)
1 Refereed Journal Publications

1. **R. Samra**, M.H. Zadeh, D. Wang, "Design of a Tactile Instrument to Measure Human Roughness Perception in a Virtual Environment", *IEEE Transactions on Instrumentation & Measurement*, Vol. 60, no. 11, Nov, 2011, pp. 3582-3591

2. **K.C. Walker**, D. Wang, *"Analytical Modeling Of Deformable Objects For Haptics Virtual Environments"*, *International Journal of Robotics and Automation*, Accepted for Publication 2010

3**. S. Fok,** D. Wang, L. Ni,G. Freeman, "A Pilot Study of Video Compression Techniques for Stereoscopic Telepresence Applications", *PRESENCE: Teleoperators & Virtual Environments* (MIT Press), Vol. 18, No. 2, 2009, pp. 139-155

4. M.Millard, **D.Wight**, J.McPhee, E.Kubica and D.Wang. "Human foot placement and balance in the sagittal plane". *ASME J.Biomech.Eng*, Vol. 131, issue 12, December 2009

5. **J. Daly**, D. Wang, "Output Feedback Sliding Mode Control in the Presence of

Unknown Disturbances",. *Systems & Control Letters,* Vol. 58, no. 3, March 2009, pp. 188-193

6**.** M.H. **Zadeh**, D. Wang and E. Kubica, "The effect of Sub-threshold Forces on Human Performance" *Multi-Modal Computer-Aided Design. Computer-Aided Design* – Elsevier journal, Vol. 42, no. 5, May 2010, pp. 471-477

7 . **K. Ziaei**, L. Ni, D. Wang, "Dynamics Modelling and QFT Based Design of Force and Contact Transition Controllers for a Flexible Link Manipulator", *IFAC Journal of Control Engineering Practice,* Vol. 17, no. 3, March 2009, pp 329-344

8. **M. H. Zadeh**, D. Wang, E. Kubica, "Perception-Based Lossy Haptic Compression Considerations for Velocity-Based Interactions", *ACM Springer Multimedia Systems Journal (Springer),* vol. 13, no. 4, pp. 275–282, Jan. 2008

9. **D. Wight**, E. Kubica, D. Wang, "Introduction of the Foot Placement Estimator: A Dynamic Measure of Balance for Bipedal Robotics", *ASME Journal of Computational and Nonlinear Dynamics,* Volume 3, Issue 1, January 2008 (10 pages)

10. **Liya Ni**, D. Wang, "A Human-to-human Force-reflecting Teleoperation System using Fuzzy Logic Controller Tuning", *The Journal of Intelligent and Robotic Systems,* Springer Verlag, Vol. 48, No. 2, pp. 209-224, 2007

11. **D. Wight**, E. Kubica, D. Wang, "Augmenting Locomotion in an Anthropomorphic System", *The Journal of Systemics, Cybernetics and Informatics,* Vol. 3, no.1, pp. 41-45, 2007

12. **T. Ravichandran**, D. Wang, G. Heppler, "Simultaneous Plant Controller Design Optimization of a Two-Link Planar Manipulator", *Mechatronics,* Vol. 16/3-4, pp. 233-242, April-May 2006

13. **K. Fregene**, D. Kennedy, R. Madhavan, L. Parker, D. Wang, "A Class of Intelligent Agents for Coordinated Control of Outdoor Terrain Mapping UGVs", Engineering Applications of Artificial Intelligence, Vol 18, no. 5, pp. 513-531, August 2005

14. **K. Fregene**, D. Kennedy, D. Wang, "Toward a Systems and Control Oriented Agent Framework", IEEE Transactions on Systems, Man and Cybernetics, Part B, Vol. 35, no.5, October 2005, pp. 999-1012

15. **E. Kubica**, **D. Madill**, D. Wang, "Designing Stable MIMIO Fuzzy Controllers", *IEEE Int. Journal of Systems, Man and Cybernetics,Part B: Cybernetics,* Vol. 35, no. 2, April 2005, pp. 372-380

16. I. Kim, **S. Fok**, **K. Fregene**, D. Lee, T. Oh, D. Wang, "Neural Network-based System Identification andn Controller Synthesis for an Industrial Sewing Maching", *International Journal of Control, Automation and Systems,* Vol. 2, No. 1, March 2004

17. **K. Ziaei**, D. Wang, "Application of Orthonormal Basis Functions for System Identification of Flexible Link Manipulators", *Control Engineering Practice,* Vol. 14, no. 2, February 2006, pp. 99-106

18. **L. Ni**, D. Wang, "A Gain Switching Control Scheme for Position-error-based Bilateral Teleoperation", *International Journal of Robotics Research*, Vol. 23, no. 3, Mar.2004, pp. 255-274

19. **F. Ching**, D. Wang, "Exact Solution and Infinite-Dimensional Stability Analysis of a Single Flexible Link in Collision", *IEEE Transactions on Robotics and Automation*, , Jan, 2004, pp. 1015-1020

20. *M. Ghanekar*, D.Wang and G.R.. Heppler, 2002, "Dynamic Equivalence Conditions for Controlled Robotic Manipulators", *AIAA Journal*, volume 41, no. 2, pages 280-287

21. *R.B. Gorbet*, K.A. Morris, D. Wang, "Passivity-based stability and control of hysteresis in smart actuators". Special Issue on Dynamics and Control of Smart Structures, *IEEE Transactions on Control Systems Technology* Vol. 9, no. 1, Jan, 2001, pp. 5-16

22. *E. Kubica*, D. Wang, 1999, "A Two-Stage Fuzzy Controller for a Flexible Link Manipulator", *International Journal of Robotics & Automation*, vol. 14, no. 1, 1999, pages 9-14

23. *R.B. Gorbet*, D. Wang, 1998, "A Dissipativity Approach to Stability of a Shape Memory Alloy Position Control System", *IEEE Transactions on Control Systems Technology*, vol. 6, no. 4, July 1998, pp. 554-562

24. *D.R. Madill*, D. Wang, 1998 "Modeling and L_2-Stability of a Shape Memory Alloy Position Control System', *IEEE Transactions on Control Systems Technology*, vol. 6, no. 4, July 1998, pp. 473-481

25. *M. Rossi*, D. Wang, *K. Zuo*, "Issues in the Design of Passive Controllers for Flexible Link Robots", *International Journal of Robotics Research*, Vol. 16, no. 4, August, 1997, pp. 577-588

26. *M. Ghanekar*, D. Wang, G. Heppler, 1997, "Scaling Laws for Linear Controllers of Flexible Link Manipulators Characterized by Nondimensional Groups", *IEEE Transactions on Robotics and Automation*, vol. 13, no.1, February 1997, pp 117-127

27. *S. Ng*, D. Wang, 1995, "Modelling and Control of a Flexible Spherical Wrist" *Robotica*, Vol. 14, no. 2, pp. 155-164

28. *K. Zuo, V. Drapeau*, D. Wang, 1995, "Closed Loop Shaped Input Strategies for Flexible Robots", *International Journal of Robotics Research*, Vol. 14, no. 5, pp 510-529

29. *K. Tuer*, M.F. Golnaraghi, D. Wang, 1994, "Development of a Generalised Active Vibration Suppression Strategy for a Cantilever Beam using Internal Resonance", *Nonlinear Dynamics*, Vol.5, pp 131-151

30. M.F. Golnaraghi, *K. Tuer*, D. Wang, 1994, "Regulation of Flexible Structures via Internal Resonance using Nonlinear Coupling Enhancement", *International Journal of Dynamics and Stability of Systems"*, Vol. 4, pp. 73-96

31. D. Wang, 1994, "Comparison of Optimal and Nonoptimal Control Strategies for the Single Flexible Link", *International Journal of Robotics and Automation*, Vol. 9, no. 3,pp

130-136

32 F. Janabi-Sharifi, W.J. Wilson, D. Wang, 1994, "On the Contact Behaviour of Manipulators Colliding with Viscoelastic Environments", *International Journal of Robotics and Automation,* Vol. 9, no. 3, pp 116-129

33 T. Ravichandran, G. Pang, D. Wang, 1993, "Robust H-infinity Control of a Single Flexible Link", *Control-Theory and Applications,* Vol. 9, no.4, pp. 887-908, Dec. 1993

34 D. Wang , J.P. Huissoon, 1993, "A Teaching Robot for Demonstrating Robot Control Strategies", *Robotica,* volume 11, pp. 393-401

35. D. Wang , M. Vidyasagar, 1992, "Passive Control of a Stiff Flexible Link", *International Journal of Robotics Research,* Vol. 11, no. 6, December, pp. 572-578

36. D. Wang , M. Vidyasagar, Feb. 1992, "Modelling of Manipulators with a Single Flexible Link", *IEEE Transactions on Robotics and Automation,* vol. 8, no. 1, pp. 33-41

37. D. Wang, M. Vidyasagar, Dec. 1991, "Control of a Class of Manipulators with the Last Link Flexible- Part I: Feedback Linearization", *ASME Journal of Dynamic Systems, Measurement and Control,* vol. 113, no. 4, pp. 655-661

38. D. Wang , M. Vidyasagar, Oct. 1991, "Transfer Function for a Single Flexible Link", *International Journal of Robotics Research,* vol 10, no. 5, pp. 540-549

39. J.P. Huissoon , D. Wang, 1991, "On the Design of a 5-Bar-Linkage Manipulator", *Robotica,* Vol. 9, pp. 441-446.

40. D. Wang , M. Vidyasagar, Dec. 1991, "Control of a Class of Manipulators with the Last Link Flexible- Part II: Observer-Controller Stabilization", *ASME Journal of Dynamic Systems, Measurement and Control* vol. 113, no. 4, pp.662-668

2 Articles submitted to refereed journals

1. **J.M. Daly**, D. Wang, "Time-Delayed Bilateral Teleoperation with Force Estimation for n-DOF Nonlinear Plants", *IEEE Transactions on Control Systems Technology,* Under Revision

2. A. Hladio, C. Nielsen, D. Wang, "Path Following for a class of mechanical systems", *IEEE Transactions on Control Systems Technology*, Under Revision

3. Book Chapters

1**.** Q. Almeida, F. Rahimi, D. Wang, F. Janabi-Sharifi(2011), "Dopaminergic Influences on Rest and Action Tremors and Emerging Therapies for Tremor", *Mechanisms and Emerging Therapies of Tremor Disorders,* Giuliana Grimaldi, Mario Manto (Ed.), Springer, Accepted for Publication

2. *Mehrdad Hosseini Zadeh*, David Wang and Eric Kubica (2010). Factors Affecting the Perception-Based Compression of Haptic Data, Advances in Haptics, Mehrdad Hosseini

Zadeh (Ed.), ISBN: 978-953-307-093-3, INTECH

4 Invited Conference Papers and Talks

1. D. Wang, "Technology Start-Up Companies: Do you have what it takes?", 2006 Canadian Undergraduate Technology Conference, Toronto, Jan. 12-14, 2006

2. S. Tam, E. Kubica, D. Wang, "A System Identification Technique for Haptic Devices", *2005 IEEE Conference on Control Applications*, Toronto ON, August 28-31st, 2004

3. M. Rossi, K. Tuer, D. Wang, "A New Design Paradigm for the Rapid Development of Haptic and Telehaptic Applications", *2005 IEEE Conference on Control Applications*, Toronto, ON, August 28-31st, 2004

4. D. Wang, "Haptics in Telerobotic Applications", CITO/OCRI Tech Talk: Transmitting Touch Over Networks, December 16, 2003

5. E. Yang, D. Wang, J. Fung, "The Legality of MP3 Distribution: A Panel Discussion", Kitchener-Waterloo IEEE Section Computer Chapter Invited Talk, Nov. 23rd, 2000, University of Waterloo.

6. D. Wang, *L. Ni, J. Shu, G. Lai, C. Caridima*, "Virtual Reality Force Reflection Applications over the Internet", Kitchener-Waterloo IEEE Section Computer Chapter Invited Talk, Nov. 27th, 2000, University of Waterloo.

7. D. Wang, *L. Ni, J. Shu*, 2000, "How to Show VR Force Reflection", *NLANR/Internet2/ CANARIE Techs Meeting*, University of Toronto, August 21, 2000,

8. *R. Gorbet*, K.A., Morris, D. Wang, 1998, "Control of Hysteretic Systems: A State-Space Approach", *Workshop on Learning, Control and Hybrid Systems*, Lecture Notes in Control and Information Sciences, Springer-Verlag, Vol. 241, Y. Yamamoto, S. Hara, eds, pp.432-451

9. *S. Ng* and D. Wang, 1993, "Modelling and Control of a Flexible Spherical Wrist", *36th Midwest Symposium on Circuits and Systems*, August 15-18, Detroit, MI., pp.385-388

10. D. Wang, 1992, "Comparison of Control Strategies for a Single Flexible Link", *Workshop on Sensing, Identification and Control of Flexible Structures* , The Fields Institute for Research in Mathematical Sciences, June 28-30, University of Waterloo, Waterloo, Ont., pp. 113-133

11. D. Vinke and D. Wang, 1990, "Optimal Improper Controllers for a Single Flexible Link", *Proceedings of the 3rd Int. Symposium on Robotics and Manufacturing*, Burnaby, BC., *pp. 557-562*

12. D. Wang and M. Vidyasagar, 1989, "Feedback Linearizability of Multi-Link Manipulators with One Flexible Link", *Proceedings of the IEEE Conference on Decision and Control*, Tampa Bay, Florida.

5 Refereed Conference Papers

1. **K. Walker**, D. Wang *"Physically-based analytical modelling of deformable haptic environments"* 2010 IEEE Haptics Symposium. Boston, MA. March 25-26, 2010

2, **A. Hladio,** C. Nielsen, D. Wang, "Path following controller design for a class of mechanical systems", 2011 IFAC World Congress, Milano, Italy, Aug. 28-Sept. 2, 2011

3. **A. Hladio**, C. Nielsen, D. Wang, "Path Following for Mechanical Systems: Experiments and examples", *2011 ACC*, San Francisco, CA, USA, June 29-July 1, 2011

4. **J.M. Daly**, D. Wang, "Time-Delayed Bilateral Teleoperation with Force Estimation for n-DOF Nonlinear Robot Manipulators", *Proceedings of the 2010 IEEE/RSJ Int. Conf. on Intelligent Robots and Systems (IROS 2010)*, Taiwan, October, 2010

5. **R. Samra,** D. Wang, M.H. Zadeh, "On Texture Perception in a Haptic-Enabled Virtual Environment", *Proceedings of IEEE International Symposium on Haptic Audio Visual Environments and Games*, Phoenix, AZ, October, 2010.

6. **R. Samra**, D. Wang, and M.H. Zadeh, "Design and Evaluation of a Haptic Tactile Actuator to Simulate Rough Textures", *Virtual Reality Conference (VR), 2010 IEEE* , pp.301-302, 20-24 March 2010.

7. **F. Rahimi**, J. Callaghan, F. Janabi-Sharifi, D. Wang, "EMG-Biofeedback and Load Sharing Problem in Assistive and Rehabilitation Orthotic Devices," *Proceedings of the 10th Annual Conference of the IEEE, Engineering in Medicine and Biology Society*, EMBC 2009. Minnesota, MN, USA, Sept 2009, pp 3000-3003.

8. **F. Rahimi**, Q. Almeida, D. Wang, F. Janabi-Sharifi, "Tremor Suppression Orthoses for Parkinson's Patients: A Frequency Range Perspective", *Proceedings of the 10th Annual Conference of the IEEE, Engineering in Medicine and Biology Society*, EMBC 2009. Minnesota, MN, USA, Sept 2009, pp 1565-1568.

9. **F. Rahimi**, D. Wang, Q. Almeida, F. Janabi-Sharifi, "Isometric Torque Generation in a Parkinsonian Tremulous Elbow and the Effect of Medication", *2009 IEEE Toronto International Conference - Science and Technology for Humanity - Symposium on Biomedical Engineering*, Ryerson University, Toronto, ON, Canada (TIC-STH 2009) pp 285-289

10. **M. Tribou**, D. Wang, W. Wilson, "Observability of Planar Combined Relative Pose and Target Model Estimation Using Monocular Vision", *2010 American Control Conference*, June 2010, pp. 4546-4551

11**, J.M. Daly,** D. Wang, "Bilateral Teleoperation Using Unknown Input Observers for Force Estimation, *Proceedings of the American Control Conference,* 2009, pp. 89-95

12. M. Millard, **D. Wight**, J. McPhee, E. Kubica, D. Wang, "Evaluation of a Human Foot Placement Model", 2008 North American Conference on Biomechanics, Aug 5-9, Ann Arbor, Michigan

13. **M.H. Zadeh**, D.Wang, E. Kubica. J. Hovis, "Adaptation to Force in the Haptic Rendering of Virtual Environments". *Haptics: Perception, Devices and Scenarios* (Proceedings of Eurohaptics 2008), LNCS 5024, Springer-Verlag, pp. 349–354.

14**. M. H. Zadeh,** D. Wang, E. Kubica. "Active manipulation of users in haptic-enabled virtual environments". *Proceedings of the 1st international Conference on Ambient Media and Systems* (Quebec, Canada, February 11 - 14, 2008). ICST (Institute for Computer Sciences Social-Informatics and Telecommunications Engineering), ICST, Brussels, Belgium, 1-8..

15. **M.H. Zadeh**, D. Wang, E. Kubica, "Human Factors for Designing a Haptic Interface for Interaction with a Virtual Enviroment", *2007 IEEE International Workshop on Haptic Audio Visual Environments and their Applications,* Vol. 1:21-26, Oct 13-14, 2007, Ottawa, ON

16. **M.H**. **Zadeh,** D. Wang, E. Kubica, "Modelling Haptic Devices using a rule-based expert system", *2005 IEEE International Workshop on Haptic Audio Visual Environments and their Applications,* Vol. 1:82-87, Oct 1-2, 2005, Ottawa, ON

17. D. Wang, M. Rossi, J. Shu, K. Tuer, "Collaborative Tele-haptics: A Pilot Study Evaluation", 2005 Laval-Virtual, 7th Virtual Reality International Conference, April 20-24th, Laval, France

18. D. Wang, L. Ni, M. Rossi, K. Tuer, "Implementation Issues for Bilateral Tele-mentoring Applications", *HAVE 2004- IEEE International Workshop on Haptic Audio Visual Environments and their Applications*, Ottawa, ON, Oct. 2-3, 2004, pp. 75-80

19. **T. Ravichandran**, G.R. Heppler, D. Wang, "Task-Based Optimal Simultaneous Manipulator/Controller Design Using Evolutionary Algorithms", *6th International Conference on Dynamics and Control of Systems and Structures in Space*, 2004, Riomaggiore, Cingue Terre, Liguaria, Italy. 18-22 July 2004.Stephen Hobbs (ed.), Cranfield University Press, 2004. pp 707 -- 716.

20. Robert S. Allison, James E. Zacher, David Wang, Joseph Shu, "Effects of network delay on a collaborative motor task" 2004 ACM SIGGRAPH International Conference on VRCAI, Singapore, June 16-18..

21. **D. Wight**, E. Kubica, D. Wang, "Augmenting Locomotion in Anthropomorphic Systems", 8th World Multiconference on Systemics, Cybernetics and Informatics(SCI 2004), Orlando, FL, July18-21, 2004

22. **T. Ravichandran**, D. Wang, G. Heppler, "Stability and Robustness of a Class on Nonlinear Controllers for Robot Manipulators", *American Control Conference*, Boston, Massachusetts, June 30-July2, 2004, pp 5262 - 5267

23. D. Wang, K. Tuer, M. Rossi, L. Ni, J. Shu, "The Effect of Time Delays on Tele-haptics", *Proceedings of the 2nd IEEE Int Workshop on Haptic, Audio and Visual Environments and their Applications- HAVE 2003,* Ottawa, ON, Sept. 20-21, 2003

24. *T. Ravichandran*, G.R. Heppler and D.W.L. Wang, "Stability Analysis of a Class of Nonlinear Controllers", *ASME International Mechanical Engineering Congress and Exposition*, Washington, DC., November 16-21, 2003.

25. *T. Ravichandran*, G.R. Heppler and D.W.L. Wang, "Simultaneous Manipulator/Controller Design Optimization Using Multi-objective Evolutionary Algorithms", *ASME International Mechanical Engineering Congress and Exposition*, Washington, DC., November 16-21, 2003.

26. *Lai, G.M.Y., Ziaei K*., Wang, D.W.L. and Heppler G.R., "Application of an Advanced Frequency Domain Identification Method for Modeling of Flexible-Link Manipulators", *ASME International Congress and Exposition*, Dynamic Systems and Control. Washington, DC., November 16-21, 2003

27. *K.Ziaei*, D. Wang, G. Heppler, "Modeling of a Constrained Flexible Manipulator", Symposium on Advances in Robot Dynamics and Control, ASME International Mechanical Engineering Congress and Exhibition, November, 2003, Washington, D.C,

28. *Kingsley Fregene*, Diane Kennedy and David Wang, ``A Study of Supervisory Constraints in a Class of Coordinated Multiagent Systems," Proceedings of the American Control Conference, Denver, CO, USA,
2003.

29. *Kingsley Fregene*, Diane Kennedy and David Wang, ``On the Stability of Coordinated Multiagent Systems with Degraded Communication," Proceedings of the American Control Conference, Denver, CO, USA, (Best Presentation Award)
2003.

30. W. Xie, *M. Krzeminski*, D. Wang, H. El-Tahan, M.. El-Tahan, "Intelligent Friction Compensation (IFC) in a Harmonic Drive", 12th Annual IEEE Newfoundland Electrical and Computer Engineering Conference (NECEC), Newfoundland, November 13, 2002.

31. *T.Ravichandran*, D. Wang, G.R. Heppler, "Optimal Nonlinear Controller Design for Set-point Control of Robot Manipulators", CCECE 2003, Montreal, Canada, May 4-7, 2003.

32. *K. Ziaei*, D. Wang, "Design and Experimental Evaluation of a Single Robust Position/Force Controller for a Single Flexible Link Manipulator in Collision", *IEEE International Conference on Robotics and Automation*, Taipei, Taiwan, Sept 2003,

33. *K. Fregene*, D. Kennedy, D. Wang, "Multi-vehicle pursuit-evasion: an agent-based framework", *IEEE International Conference on Robotics and Automation*, Taipei, Taiwan, Sept. 2003,

34. *L. Ni* and D. Wang "Fuzzy Logic Controller Tuning for a Human-to-Human Force-Reflecting Teleoperation System", *The 2002 International Conference on Control and Automation*, June 16-19, 2002, Xiamen, China

35. *L. Ni* and D. Wang, "A Gain Switching Control Scheme for Position-error-based Force-reflecting Teleoperation", *10th Symposium on Haptic Interfaces for Virtual Environment and Teleoperation Systems*, March *24-25*, 2002, Orlando, Florida, U.S.A.

36. *L. Ni* and D. Wang, "Contact Transition Stability Analysis for a Bilateral Teleoperation System", *2002 IEEE International Conference on Robotics and Automation*, May 2002, Washington, DC, U.S.A.

37. *T. Ravichandran,* G. Heppler and D. Wang, "Optimal Multi-objective Manipulator/Controller Design for Space Applications", to appear at the *5th International Conference on Dynamics and Control of Systems and Structures in Space,* 2002.

38. *K. Fregene,* D. Kennedy and D. Wang, "HICA: A Minimal Framework for Distributed Multi-agent Control", *Intelligent Systems and Control,* Tampa, Florida, November 2001.

39. E. Kubica, D. Wang and D. Winter, 2001, "Feedforward and Deterministic Fuzzy Control of Balance and Posture during Human Gait", *IEEE International Conference on Robotics and Automation 2001,* May 2001, Seoul, Korea, Vol. 3, pp. 2293-2298.

40.*G. Lai, C. Caradima,* D. Wang, "A Mechatronics Approach to Safe, Stable Teleoperation in Medical Applications", 26th Biennial Mechanisms and Robotics Conference, ASME Design Technical Conferences, September 10-13, 2000, Baltimore Maryland

41. *C. Caradima,* D. Wang, "Time Delay Compensation and Stability Issues in Teleoperation", IMECE 2000 Conference, ASME Winter Annual Conference, Nov. 5-10, 2000, Orlando, FL

42 *D. Madill,* D. Wang, 1999, "A Mechatronics Approach to the Control of a Haptic Interface", *1999 International Mechanical Engineering Congress and Exposition,* Nov. 14-19, 1999, Nashville, TN

43. *F. Ching* **,** D. Wang, 1999, "An Infinite-dimensional Analysis of a PD-Controlled Single Flexible Link in Collision", *IEEE International Conference on Robotics and Automation,* May 1999, Detroit**,** Michigan, USA, pp. 419-426,

44.*M. Ghanekar,* D. Wang, G. Heppler, 1999, "Scaling Laws for the Dynamics and Control of Flexible Link Manipulators", *IEEE International Conference on Robotics and Automation",* Detroit, Michigan - May 1999, pages 427-434

45. *R.B. Gorbet,* D. Wang and K.A. Morris, 1998, "Preisach Model Identification of a Two-Wire SMA Actuator", *IEEE International Conference on Robotics and Automation* ", (Leuven, Belgium) May 16-2 1 1998, pp. 2161-2167

46. *M. Ghanekar,* D. Wang, G. Heppler, 1998, "Scaling Laws for Nonlinear Controllers of Dynamically Equivalent Rigid-Link Manipulators", *Proceedings of the 1998 IEEE International Conference on Robotics and Automation* (Leuven, Belgium), pp. 2633-2639

47. *R.B. Gorbet,* K.A. Morris, D. Wang, 1997, "Stability of Control for the Preisach Hysteresis Model", *1997 IEEE International Conference on Robotics and Automation,* Albuquerque, New Mexico, April 1997, Vol. 1, pp. 241-247

48.*M. Ching,* D. Wang, 1997, "A Five-bar-linkage Force Reflecting Interface for a Virtual Reality System", *1997 IEEE International Conference on Robotics and Automation,* Albuquerque, New Mexico, April 1997, pp 3012-3017

49. *S. Moorehead,* D. Wang, 1997, "An Experimental Study of Contact Transition Control of a Single Flexible Link using Positive Acceleration Feedback", *1997 IEEE International Conference on Robotics and Automation,* Albuquerque, New Mexico, April 1997, pp

2838-2843

50.*M. Rossi,* D. Wang, 1996, "Hybrid Passive Adaptive Control of a Single Flexible Link Manipulator with a Payload", *1996 Proceedings of the IEEE Conference on Robotics and Automation,* Minneapolis, MN, pp 2109-2116

51. *S. Moorehead,* D. Wang, 1996, "Collision Detection using a Flexible Link Manipulator: A Feasibility Study", *1996 Proceedings of the IEEE Conference on Robotics and Automation,* Minneapolis, MN, pp. 804-809

52. *C. Trautman,* D. Wang, 1996, "Noncollocated Passive Control of a Flexible Link Manipulator" *1996 Proc. of the 1EEE Conf on Robotics and Automation,* Minneapolis, MN, pp. 1107-1114

53. *E. Kubica,* D. Wang and D.A. Winter, 1995, "Modelling Balance and Posture Control Mechanism of the Upper Body using Conventional and Fuzzy Techniques", *North American Clinical Gait Laboratory Conference,* Waterloo, Canada (Refereed Abstract, 2 pages)

54. *M. Ghanekar* D. Wang and G.H. Heppler, 1995, " Controller Scaling Laws for Flexible Link Manipulators Characterized by Nondimensional Pi Groups", *1995 American Control Conference* Seattle, Washington, 6:4101-4105, June 1995.

55. *M. Ghanekar* D. Wang and G. Heppler, 1995, " Scaling Laws for Frequency Domain Controllers of Dynamically Equivalent Single Flexible Link Manipulators", *1995 Proceedings of the iEEE Conference on Robotics and Automation,* Nagoya, Japan, 1:919-924, May, 1995

56. *C. Trautman,* D. Wang, "Experimental H-infinity Control of a Single Flexible Link with a Shoulder Joint", *1995 Proceedings of the IEEE Conference on Robotic and Automation* Nagoya, Japan, 1:1235-1241, May 1995

57. *R.B. Gorbet,* D. Wang, 1995, "General Stability Criteria for a Shape Memory Alloy Position Control System", *1995 Proceedings of the IEEE Conference on Robotics and Automation,* Nagoya, Japan, No. 3, pp. 2313-2319

58. *D. Madill,* D. Wang, 1994, "L_2-stability of a Shape Memory Alloy Position Control System", *33rd Conference on Decision and Control,* Orlando, Florida, pp. 399-404

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