



**Robert L. Williams II, Ph.D.**  
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### **Executive Summary**

Dr. Robert L. Williams II is professor and assistant chair of mechanical engineering at Ohio University, focusing on robotics, biomechanics, and haptics research and education. Previously he worked for 5 years at NASA Langley Research Center as a space roboticist. He earned the Ph.D. in mechanical engineering from Virginia Tech. Dr. Williams has published 44 journal articles and 128 conference papers in dynamics, control, robotics, biomechanics, and haptics. He is a reviewer for many international conferences and journals including the ASME and IEEE. He has attracted externally-funded projects totaling nearly \$5M. During his time at Ohio University, he has worked two summers each at NASA Kennedy Space Center and Wright-Patterson AFB. During his 2002-2003 sabbatical he worked for the NIST Intelligent Systems Division in Gaithersburg MD and during his Fall 2014 sabbatical he was visiting professor in the Departamento de Ingeniería Mecánica at the Universidad de Puerto Rico, Mayaguez. Dr. Williams' research interests include parallel robots, cable-suspended robots, mobile robots, biomechanics, and haptics for education and training. Dr. Williams is the ASME advisor for the Ohio University student chapter, he has taught summer robotics programs to middle school students, was the MathCounts coach for Athens Middle School, and the TEAMS JETS coach for Athens High School. He serves as lead guitarist in a praise band for a local church.

## Curriculum Vitae

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#### Education

Ph.D. Mechanical Engineering	Virginia Tech	GPA 4.0/4.0	Parallel robotic mechanisms	1988
MS Mechanical Engineering	Virginia Tech	GPA 3.9/4.0	Spatial mechanisms	1985
BS Mechanical Engineering	Ohio University	GPA 3.9/4.0	Outstanding engineering senior	1984

#### Professional Experience

Visiting Professor, Mechanical Engineering	U. of Puerto Rico Mayaguez	2014
Professor, Mechanical Engineering	Ohio University	2005-present
Associate Professor, Mechanical Engineering	Ohio University	2000-2005
Visiting Researcher, Intelligent Systems Division	NIST (sabbatical)	2002-2003
Assistant Professor, Mechanical Engineering	Ohio University	1994-2000
Human Sensory Feedback Lab Summer Research	Wright-Patterson AFB	1997, 1998
NASA/ASEE Summer Faculty Fellowship	Kennedy Space Center	1995, 1996
NASA Space Roboticist	NASA Langley Research Center	1989-1994
Adjunct Professor, Mechanical Engineering	George Washington University	1993
Assistant Professor (1-year), Mechanical Engineering	Virginia Tech	1988-1989

#### External Research Funding

NSF DUE	<i>ACE: Appalachian Cohort for Engineering</i>	2012	\$599,599
NSF CRI/CNS	<i>DARwIn Humanoid Robots (Va Tech subcontract)</i>	2011	\$13,700
NSF DUE CCLI	<i>Interactive Virtual Haptics-Augmented Dynamics</i>	2010	\$199,720
NSF MRI	<i>Comparative Experimental Biomechanics Hardware</i>	2009	\$401,083
American Osteopathic	<i>Extension of the VHB for Motion Testing</i>	2008-2010	\$100,000
Brentwood Foundation	<i>Haptic Modules for Palpatory Diagnosis Training</i>	2008-2009	\$105,149
AFOSR	<i>Biomimetic Aerial Robotic Transformer Feasibility</i>	2007	\$150,000
Heritage Foundation	<i>The Virtual Haptic Back for Osteopathic Training</i>	2002-2007	\$1,160,286
NIST	<i>Cable Robots with Independent Metrology</i>	2003-2004	\$49,988
NIST	<i>Novel Cable-Direct-Driven Robot Development</i>	2002-2003	\$57,099
NSF	<i>Haptics-Augmented Engineering Education</i>	2002-2003	\$75,000
NASA LaRC	<i>Haptics-Augmented K-12 Education</i>	2001-2003	\$168,975
AFRL, HSF	<i>Space-Based Force-Reflecting Teleoperation</i>	2001	\$20,000
NASA LaRC	<i>Haptics-Augmented K-12 Science Education</i>	1998-2000	\$60,461
AFRL, HSF	<i>Force-Reflecting Teleoperation Experimentation</i>	1999	\$16,516
Stewart-Glapat, Inc.	<i>Pallet Handling Device</i>	1998	\$34,561
AFRL, HSF	<i>Haptics and Related Research</i>	1998	\$15,000
AFOSR DUAP	<i>Integration of ATB and LSDYNA3D</i>	1998	\$200,000
JLG Industries Inc.	<i>Aluminum Boom Optimization</i>	1998	\$9,800
AFRL, HSF	<i>Force-Reflecting Teleoperation Implementation</i>	1997	\$19,120
NSF / U. of Delaware	<i>Simulation of Free-Floating Space Robots</i>	1996	\$15,317
Batelle	<i>VGT Manipulator Advanced Control Algorithms</i>	1995	\$10,000

#### Other Research Funding (partial)

Ohio U. Avionics	Salary, hardware support for mobile robot	2002-2003	\$34,882
AFOSR, WPAFB	Summer Graduate Student, Jason Henry	1998	\$8,388
AFOSR, WPAFB	Summer Faculty Fellowship	1997	\$13,560
AFOSR, WPAFB	Summer Graduate Student, Mark Murphy	1997	\$8,160
NASA LaRC	Donation of Telerobotic Hardware	1996	\$321,038
NASA KSC	Summer Faculty Fellowship	1995,1996	\$23,351

#### Graduate Student Summary

60 MSME and MSEECS Students graduated; 63% of these are U.S. citizens. 7 Ph.D. ME and EECS students graduated.

### Ohio University Research Funding (partial)

1804 Research	<i>Elastic Tendon-Driven Robot</i>	2011-2013	\$34,700
1804 Research	<i>Regenerative Supercirculation Wing</i>	2004-2006	\$30,000
1804 Research	<i>Artificial Muscles for Gerontology</i>	2003-2005	\$30,000
1804 Research	<i>The Aeromobile Project</i>	2002-2004	\$34,500
1804 Research	<i>The Virtual Haptic Back</i>	2001-2003	\$34,000
Baker Award	<i>Cable-Direct-Driven Robots</i>	2000-2001	\$10,000
Stocker Research	<i>Novel Cable Robot Prototype</i>	2001	\$10,000
1804 Research	<i>RoboCup: An Interdisciplinary Research Testbed</i>	2000-2002	\$43,000
1804 Education	<i>RoboCup Junior for Disadvantaged K-12 Schools</i>	2000-2002	\$29,500
OU Assessment Award	<i>Mechanical Engineering</i>	1998-1999	\$25,000

### Publications Summary

46 Journal Articles, 5 Invited Conference Papers, 70 Peer-Reviewed Conference Papers, 4 Peer-Reviewed Conference Videotapes, 1 Graduate Controls Textbook, 1 Robotics Textbook Augmentation, 1 Mechanisms Textbook Augmentation, 2 U.S. Patents, 9 Provisional Patents, 56 Abstract-Reviewed Conference Papers, 55 External Technical Reports, 20 OU Reports, 2 Refereed NASA Technical Papers, 6 NASA Technical Memoranda, 1 NASA Conference Proceedings (editor).

### Honors and Recognitions (partial)

• NASA Certificate of Appreciation EPSCoR	NASA	2011, 2012, 2013, 2014
• Russ Outstanding Undergraduate Teaching Award	Ohio University	2011, 2005
• Mechanical Engineering White Teaching Award	Ohio University	2011, 2007, 2000, 1995
• Best Research Paper Award	SSIH	2009
• Mechanical Engineering Research Award	Ohio University	2008, 2002, 1997
• ASME Certificate of Appreciation	Conf. Papers Review Coordinator	2007, 2006, 2005
• Outstanding Contributions to Intellectual Property	Ohio University	2005
• MathCounts Certificate of Achievement	6 <sup>th</sup> place state of Ohio	2005
• Outstanding Research Paper Award, Nominated	Ohio University	2004
• WERB Manuscript Commendation	NIST	2003
• Mechanical Engineering Research Award	Ohio University	2003
• Best Undergraduate Mechanisms Design	ASME Design Conferences	2000
• P&G Best Paper Award	Applied Mech. & Robotics Conf.	1999
• Best Graduate Student Paper	Applied Mech. & Robotics Conf.	1999
• Outstanding Outcomes-Based Assessment	Ohio University	1998
• ASME Certificate of Appreciation	ASME Student Section Advisor	1995-2000
• Mechanical Engineering Research Award	Ohio University	1998
• Promising Young Investigator Award	Applied Mech. & Robotics Conf.	1997
• P&G Best Paper Award	Applied Mech. & Robotics Conf.	1997

### Courses Taught (Ohio University)

#### Required courses:

ET 2240	Dynamics	sophomore
ME 3011	Kinematics & Dynamics of Machinery	junior
ME 3012	Analysis & Control of Linear Systems & Vibrations	senior
ME 6011	Advanced Analysis & Control of Linear Systems	graduate (core course)

#### Elective courses:

UC 1900	Mechanical Engineering Learning Community	freshman
ME 4290/5290	Robotic Manipulators and Haptics	senior/graduate
ME 4670/5670	Biomechanics	senior/graduate

### Professional Memberships

ASME, ASME International Mechanisms Committee (Robot Kinematics and Dynamics subcommittee chair – conference sessions organization 13 times since 1994; non-voting status since 2000), Ohio University ASME Student Section Advisor, IEEE, ASEE, Pi Tau Sigma, Tau Beta Pi, Order of the Engineer, Reviewer for ASME and IEEE journals and conferences.

### Journal Articles

- R.L. Williams II and R. Lucas, 2017, "The 2-dof RRSSR Parallel Robot: Forward and Inverse Position Kinematics Solutions", *International Journal of Engineering and Robot Technology*, 3(2): 29-38.
- E. Kljuno, J.J. Zhu, and R.L. Williams II, 2016, "A Biomimetic Elastic Cable-Driven Quadruped Robot: Design, Dynamics, and Controls", *Austin Journal of Robotics & Automation*, February 2016.
- E. Karadogan and R.L. Williams II, 2013, "The Robotic Lumbar Spine (RLS): Dynamics and Feedback Linearization Control", *Hindawi Journal of Computational and Mathematical Models in Medicine*, special issue on Numerical Methods and Applications in Biomechanical Modeling, doi: 10.1155/2013/985248, 12 pages.
- D.R. Moore, R.L. Williams II, T. Luo, E. Karadogan, 2013, "Elusive Achievement Effects of Haptic Feedback", *Journal of Interactive Learning Research*, JILR 24(3): 329-347.
- R.L. Williams II, 2013, "Simplified Robotics Joint-Space Trajectory Generation with Via Point using a Single Polynomial", *Hindawi Journal of Robotics*, Article ID 735958, 6 pages, March, doi: 10.1155/2013/735958.
- E. Karadogan and R.L. Williams II, 2013, "Haptic Modules for Palpatory Diagnosis Training of Medical Students", *Virtual Reality Journal*, Springer, 17(1): 45-48.
- E. Karadogan and R.L. Williams II, 2012, "Three-Dimensional Static Modeling of the Lumbar Spine", *Journal of Biomechanical Engineering*, Transactions of the ASME, 134(8): 084504-1-084504-5.
- R.L. Williams II and J. Wu, 2010, "Dynamic Obstacle Avoidance for an Omni-Directional Mobile Robot", *Hindawi Journal of Robotics*, Vol 2010, Article ID 901365, 14 pages.
- E. Karadogan, R.L. Williams II, J.N. Howell, and R.R. Conatser Jr., 2010, "A Stiffness Discrimination Experiment including Analysis of Palpation Forces and Velocities", *The Journal of the Society for Simulation in Healthcare*, 5(5):279-288, October.
- E. Kljuno and R.L. Williams II, 2010, "Humanoid Walking Robot: Modeling, Inverse Dynamics, and Gain Scheduling Control", *Hindawi Journal of Robotics*, Vol 2010, Article ID 278597, 19 pages.
- E. Kljuno and R.L. Williams II, 2008, "Vehicle Simulation System: Controls and Virtual-Reality-Based Dynamics Simulation", *Journal of Intelligent and Robotic Systems*, 52: 79-99.
- Y. Liu, J.J. Zhu, R.L. Williams II, and J. Wu, 2008, "Omni-Directional Mobile Robot Controller Based on Trajectory Linearization", *Journal of Robotics and Autonomous Systems*, 56: 461-479.
- J.N. Howell, R.R. Conatser Jr., R.L. Williams II, J.M. Burns, and D.C. Eland, 2008, "The Virtual Haptic Back: A Simulation for Training in Palpatory Diagnosis", *BMC Medical Education*, April: 8-14.
- J.N. Howell, R.R. Conatser Jr., R.L. Williams II, D.C. Eland, and J.M. Burns, 2008, "Palpatory Diagnosis Training on the Virtual Haptic Back: Performance Improvement and User Evaluations", *The Journal of the American Osteopathic Association*, 108(1): 29-36.
- P. Bosscher, R.L. Williams II, L.S. Bryson, and D. Castro-Lacouture, 2007, "Cable-Suspended Robotic Contour Crafting System", *Journal of Automation in Construction*, 17: 45-55.
- R.L. Williams II, W. Ji, J.N. Howell, and R.R. Conatser Jr., 2007, "Device for Measurement of Human Tissue Properties In Vivo", *ASME Journal of Medical Devices*, 1(3): 197-205.
- R.L. Williams II, X. He, T. Franklin, and S. Wang, 2007, "Haptics-Augmented Engineering Mechanics Educational Tools", *World Transactions on Engineering and Technology Education*, 6(1): 27-30.
- J. Wu, R.L. Williams II, and J.Y. Lew, 2006, "Velocity and Acceleration Cones for Kinematic and Dynamic Constraints on Omni-Directional Mobile Robots", *ASME Transactions on Dynamic Systems, Measurement, and Control*, 128(4): 788-799.

- A. Trevisani, P. Gallina, and R.L. Williams II, 2006, "Cable-Direct-Driven Robot (CDDR) with Passive SCARA Support: Theory and Simulation", *Journal of Intelligent and Robotic Systems*, 46: 73-94.
- R.L. Williams II, 2005, "Novel Cable-Suspended RoboCrane Support", *Industrial Robot: An International Journal*, 32(4): 326-333.
- K.L. Holland, R.L. Williams II, R.R. Conatser Jr., J.N. Howell, and D.L. Cade, 2004, "Implementation and Evaluation of a Virtual Haptic Back", *Virtual Reality Society Journal*, 7: 94-102.
- R.L. Williams II, M. Srivastava, R.R. Conatser Jr., and J.N. Howell, 2004, "Implementation and Evaluation of a Haptic Playback System", *Haptics-e Journal, IEEE Robotics & Automation Society*, 3(3): 1-6.
- R.L. Williams II, J.S. Albus, and R.V. Bostelman, 2004, "Self-Contained Automated Construction Deposition System", *Automation in Construction*, 13: 393-407.
- R.L. Williams II, J.S. Albus, and R.V. Bostelman, 2004, "3D Cable-Based Cartesian Metrology System", *Journal of Robotic Systems*, 21(5): 237-257.
- R.L. Williams II and P. Gallina, 2003, "Translational Planar Cable-Direct-Driven Robots", *Journal of Intelligent and Robotic Systems*, 37: 69-96.
- R.L. Williams II, M.Y. Chen, and J.M. Seaton, 2003, "Haptics-Augmented Simple Machines Educational Tools", *Journal of Science Education and Technology*, 12(1): 16-27.
- R.L. Williams II, P. Gallina, and J. Vadia, 2003, "Planar Translational Cable-Direct-Driven Robots", *Journal of Robotic Systems*, 20(3): 107-120.
- R.L. Williams II and P. Gallina, 2002, "Planar Cable-Direct-Driven Robots: Design for Wrench Exertion", *Journal of Intelligent and Robotic Systems*, 35: 203-219.
- B.R. Hopkins and R.L. Williams II, 2002, "Kinematics, Design, and Control of the 6-PSU Platform", *Industrial Robot: An International Journal*, 29(5): 443-451.
- R.L. Williams II, B.E. Carter, P. Gallina, and G. Rosati, 2002, "Dynamic Model with Slip for Wheeled Omni-Directional Robots", *IEEE Transactions on Robotics and Automation*, 18(3): 285-293.
- R.L. Williams II, M.Y. Chen, and J.M. Seaton, 2001, "Haptics-Augmented High School Physics Tutorials", *International Journal of Virtual Reality*, 5(1): 1-17.
- R.L. Williams II and D.B. Poling, 2001, "Spherically-Actuated Platform Manipulator", *Journal of Robotic Systems*, 18(3): 147-157.
- J.J. Hall and R.L. Williams II, 2000, "Inertial Measurement Unit Calibration Platform", *Journal of Robotic Systems*, 17(11): 623-632.
- J.J. Ottersbach and R.L. Williams II, 2000, "Prototype Trailer-Loading Robot", *Industrial Robot: An International Journal*, 27(4): 288-298.
- R.L. Williams II, J.M. Henry, and D.W. Repperger, 2000, "Evaluation of Rate-Based Force-Reflecting Teleoperation in Free Motion and Contact", *Presence: Teleoperators and Virtual Environments*, 9(1): 25-36.
- R.L. Williams II, J.M. Henry, M.A. Murphy, and D.W. Repperger, 1999, "Naturally-Transitioning Rate-to-Force Control in Free and Constrained Motion", *Journal of Dynamic Systems, Measurement, and Control, Transactions of the ASME*, 121(3): 425-432.
- R.L. Williams II, 1999, "Singularities of a Manipulator with Offset Wrist", *Journal of Mechanical Design, Transactions of the ASME*, 121(2): 315-319.

R.L. Williams II, 1999, "Inverse Kinematics and Singularities of Manipulators with Offset Wrist", *International Journal of Robotics and Automation*, 14(1): 1-8.

H. Pasic, R.L. Williams II and C. Hui, 1999, "A Numerical Algorithm for Solving Manipulator Forward Dynamics", *Mechanism and Machine Theory*, 34: 843-855.

D. Tong, R.L. Williams II, and S.K. Agrawal, 1998, "Optimal Shape Control of Composite Thin Plates with Piezoelectric Actuators", *Journal of Intelligent Material Systems and Structures*, 9: 458-467.

R.L. Williams II, 1998, "Cable-Suspended Haptic Interface", *International Journal of Virtual Reality*, 3(3): 13-21.

R.L. Williams II and E.R. Hexter IV, 1998, "Maximizing Kinematic Motion for a 3-DOF Variable Geometry Truss Module", *Journal of Mechanical Design, Transactions of the ASME*, 120(2): 333-336.

R.L. Williams II, 1997, "Control of Kinesthetic Haptic Interfaces in VR Applications", *International Journal of Virtual Reality*, 3(1): 18-26.

R.L. Williams II and R.J. Kuriger, 1997, "Kinematics, Statics, and Dexterity of Planar Active Structure Modules", *Automation in Construction*, 7: 77-89.

R.L. Williams II and C.F. Reinholtz, 1987, "Mechanism Link Rotatability and Limit Position Analysis Using Polynomial Discriminants", *Journal of Mechanisms, Transmissions, and Automation in Design, Transactions of the ASME*, 109(2): 178-182.

R.L. Williams II and C.F. Reinholtz, 1986, "Proof of Grashof's Law Using Polynomial Discriminants", *Journal of Mechanisms, Transmissions, and Automation in Design, Transactions of the ASME*, 108(4): 562-564.