

**Kevin W. Hollander, PhD**  
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Augspurger Komm Engineering, Inc.  
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## **EDUCATION**

Ph.D. in Mechanical Engineering, Arizona State University, 2005  
M.S. in Mechanical Engineering, University of New Mexico, 1997  
B.S. in Mechanical Engineering, University of Missouri, 1994

## **SUMMARY**

For more than 20 years Dr. Hollander has had extensive experience in analyzing and modeling, both biological and mechanical systems, as well as their interactions. This experience has included the design and development of numerous mechanical devices, robots and electronic measurement instruments.

At Augspurgen Komm Engineering, Inc. his broad skill set and knowledge has been applied to the analysis of vehicular accidents/reconstruction, tire failures, equipment fires/failures and related personal injury.

At SpringActive, Inc. his knowledge and skill have been applied to managing and leading the creation and development of multiple wearable robotic products. Dr. Hollander has been involved in all aspects of this development from concept creation, to government funding acquisition, to licensing of technology to manufacturing/marketing partners.

## **EXPERIENCE**

2006-Present Augspurgen Komm Engineering, Inc., Senior Engineering Consultant  
2006-2019 SpringActive, Inc., Owner/Dir. of Product Development/Senior Engineer  
2002-2005 Infinea Solutions, Inc., Owner/President  
1998-2002 Barnes-Jewish Hospital, Clinical Research Manager/Engineer  
1997 Saint Charles Community College, Adjunct Faculty in Mechanical Design  
1996-1997 Independent Consulting  
1992 Union Electric, Co. – Rush Island Power Plant, Engineer  
1991 GenCorp Automotive, Engineer

## **PROFFESIONAL AFFILIATIONS**

American Society of Mechanical Engineers (ASME Member)  
American Society of Testing and Materials (ASTM) International  
Mechanical Engineering Graduate Association (MEGA), President 1996-1997  
Society of Automotive Engineers (SAE Member) International –  
UNM Formula Car Team Advisor 1996-1997

## **SEMINARS**

SFPE Annual Conference & Expo, Nashville, TN, October 28-30, 2018  
Fire & Evacuation Modeling Technical Conference, Gaithersburg, MD, October 11-13, 2018  
Forensic Photography Techniques, Michael Wilson, Phoenix, AZ, December 18, 2008  
Vehicle Accident Reconstruction Methods, April 19-20, 2007 – Society of Automotive Engineers (SAE), Detroit, MI.  
Introduction to PC Crash and PC-Rect, August 22-23, 2006 – MEA  
Introduction to Major Testing Techniques for Plastics, September 20-22, 2005  
ASTM International, San Diego, CA.

## **AWARDS**

2010 Outstanding Paper Award Winner, “Robotic Transtibial Prosthesis with Biomechanical Energy Regeneration”  
2005 Second Place, ASME Student Mechanism Design Competition (Graduate Division)  
1997 Regional Award, ASME New Mexico Senior Section Web Page

## **PROFESSIONAL ACTIVITIES**

2019 Subject Matter Expert, Grand Canyon University, Advanced Robotics & Lab (ESG-430) Course Development  
2014 ASME IDETC Session Co-Chair  
2005 ASME IDETC Session Co-Chair  
Reviewer for various IEEE, ASME Conference and Journal Publications

## **THESIS TOPICS**

2005 Ph.D. Thesis, Development of Compliant Actuation Systems for Wearable Robotics Applications  
1997 Masters Thesis, Mechanical Loading of Tendon: Experimental Apparatus and Modeling  
1994 Undergraduate Research, Cortical Bone as an Engineering Material

## **RESEARCH SUPPORT**

2019 Air Force, Exoskeletons for Aerial Porters, (\$1,230,963) 2 years (Key Personnel/Co-Inventor)  
2017 Army, STTR Phase I, *Passive SPARKy-P Prostheses (Spring Ankle with Regenerative Kinetics)*. (\$150,000), 6 months (Key Personnel/Co-Inventor)  
2016 ASU – Piper Seed Grant, *Developing a powered Ankle Foot Orthosis to enhance gait performance and decrease falls following stroke*. (\$50,000), 7 months, (Subcontract PI/\$10,000)

### **RESEARCH SUPPORT – Continued**

- 2015 Army –TATRC, *Ruggedized Odyssey Ankle for Soldiers* – Contract Extension, (\$370,000), 12 months, (Co-Investigator)
- 2015 National Science Foundation (NSF), SBIR Phase I, (\$150,000), 6 months (Key Personnel/Co-Inventor)
- 2015 DARPA, *Hip Exoskeleton for Superior Assistance (HeSA)*, (\$548,903), 14 months, (Subcontract PI/\$237,378)
- 2014 National Institutes of Health (NIH), SBIR Phase II, *Powered Walk/Run Prosthetic Ankle*, (\$1,123,625), 2 years, (Co-Investigator)
- 2013 DARPA, *Joint Torque Augmentation Robot (JTAR) for Soldier Assistance 2.0*, (\$680,156), 1 year, (Primary Investigator)
- 2012 Army - TATRC, *Ruggedized Odyssey Ankle for Soldiers*, (\$1,364,587), 2 years, (Primary Investigator/Co-Investigator)
- 2012 National Science Foundation (NSF), SBIR Phase IIB, *Compliant Jack Spring Actuators for Lower Limb Mobility*, (\$353,091), 18 months, (Primary Investigator)
- 2011 DARPA, *Joint Torque Augmentation Robot (JTAR) for Soldier Assistance 1/1B Extension*, (\$621,600), 1 year, (Primary Investigator)
- 2011 National Institutes of Health (NIH), SBIR Phase I, *Powered Walk/Run Prosthetic Ankle, PWR Ankle*, (\$110,832), 16 months, (Primary Investigator)
- 2010 Army- West Point, *West Point Bionic Ankle – Running Prosthetic Development*, (\$50,000), 8 months. (Subcontract PI, \$47,000 subcontract)
- 2010 National Science Foundation (NSF). *Compliant JackSpring Actuators for Lower Limb Mobility*. SBIR Phase II (\$500,000), 2 years, (Primary Investigator)
- 2010 Army – Natick Soldier Systems, *Soldier Power Regeneration Kit (SPaRK)*, Phase II, (\$430,000), 1 year, (Subcontract PI/\$330k subcontract)
- 2009 Army - Natick Soldier Systems, *Soldier Power Regeneration Kit (SPaRK)*, (\$150,000), 1 year, (Subcontract PI/\$99k subcontract)
- 2009 National Science Foundation (NSF). *Compliant Jack Spring Actuators for Lower Limb Mobility*. SBIR (\$100,000), 6 months. (Primary Investigator)
- 2006 Army - TATRC/Walter Reed Hospital, *SPARKY-Spring Ankle with Regenerative Kinetics*, (\$605,000), 3 years. (Consultant)
- 2005 National Institutes of Health (NIH). *Robotic Spring Ankle for Gait Assistance, Development and Evaluation*. (\$359,000). 2 years. (Consultant)
- 2003 National Institutes of Health (NIH). *Radio Frequency Motion Tracking System*. SBIR (\$95,002), 1 year. (Inventor/Author/ Consultant)

### **INVITED TALKS**

- 2016 WearRACon, Wearable Robotics Association Conference, Spotlight Demonstration. “SpringActive”. Phoenix, AZ, February.
- 2015 American Orthotics and Prosthetics Association (AOPA), National Assembly, Spotlight Symposium. “Wearable Robotics: Lessons Learned”, San Antonio, TX, October.

### **INVITED TALKS – Continued**

- 2005 MAE Seminar. “Robotic Tendon for Ankle Gait Assistance.” Arizona State University, February.
- 2003 Lecture. “Current Research in Robotics”. Tempe Public Library, September.
- 2003 Lecture Series. “MAE 446: Lectures on ANSYS/FEA”. Arizona State University, Spring.

### **PATENTS**

- 2019 System and Method of Bidirectional Compliant Joint Torque Actuation, U.S. Patent 10,449, 105
- 2017 Joint torque augmentation system and method for gait assistance, U.S. Patent 9,662,262
- 2016 Gravitational Load Support System, U.S. Appl. 20160023350
- 2014 Systems and methods for gravitational load support, U.S. Appl. 20140259798
- 2014 Quasi-active prosthetic joint system, US 9,289,316
- 2011 Method and Apparatus for Harvesting Energy from Ankle Motion, U.S. 8,716,877
- 2011 Adjustable Stiffness Jack Spring Actuator, U.S. 8,322,695
- 2004 Adjustable Stiffness Jack Spring Actuator, U.S. 7,992,849
- 2004 Adjustable Stiffness Leaf Spring Actuators, U.S. 7,527,253
- 2003 Method and Apparatus for Determining the Position and Orientation of an Object using a Doppler Shift of Electromagnetic Signals, U.S. Appl. 20040196184

### **BOOKS/CHAPTERS**

- Sharbafi, Mazier A.; Lee, David; Sugar, Thomas G; Ward, Jeffrey; Hollander, Kevin W; Hosoda, Koh, Seyfarth, Andre'; Chapter 9 – Conclusion – Bioinspired Legged Locomotion, Butterworth-Heinemann, 2017
- Sugar, TG, Fernandez, E, Kinney, D, Hollander, KW and Redkar, S, 2017, “HeSA, Hip Exoskeleton for Superior Assistance”, *Wearable Robotics: Challenges and Trends*, Springer International Publishing, pp. 319-323.
- Hollander, KW, and Sugar TG, 2007, “Chapter 12: Powered Human Gait Assistance”, In Kommu, SS, (ed.), *Rehabilitation Robotics*, I-Tech Education and Publishing, pp. 203-220.

## **JOURNAL PUBLICATIONS**

J14. Grimmer, M, Holgate, M, Holgate, R, Boehler, A, Ward, J, Hollander, KW, Sugar, TG and Seyfarth, A, 2016, "A Powered Prosthetic Ankle Joint for Walking and Running", *BioMed Eng OnLine*, 15(3):141.

J13. Sugar, TG, Hollander, KW, Boehler, A, Ward, J, 2013, "Comparison and Analysis of a Robotic Tendon and Jackspring™ Actuator for Wearable Robotic Systems", *ASME Journal of Medical Devices*.

J12. Van Ham, R, Sugar, TG, Vanderborght, B, Hollander, KW, Lefeber, D, 2009, "Review of Actuators with Passive Adjustable Compliance / Controllable Stiffness for Robotic Applications", *IEEE Robotics & Automation Magazine*, 16(3), pp. 81-94, September.

J11. Hitt, J, Holgate, M, Bellman, R, Sugar, TG, Hollander, KW, 2009, "Robotic Transtibial Prosthesis with Biomechanical Energy Regeneration", *Industrial Robot: An International Journal*, 36(5), pp. 441-447. (**Outstanding Paper Award Winner, 2010**)

J10. Van Ham, R, Sugar, TG, Vanderborght, B, Hollander, KW and Lefeber, D, 2009, "Compliant Actuator Designs", *IEEE Robotics & Automation Magazine*, 16(3), 81-94.

J9. Vanderborght, B, Van Ham, R, Sugar, TG, Hollander, KW and Lefeber, D, 2009, "Comparison of Mechanical Design and Energy Consumption of Adaptable Passive Compliant Actuators." *International Journal of Robotics Research*, 28(1), pp. 90-103, January.

J8. Ward, J, Boehler, A, Shin, D, Hollander, KW and Sugar, TG, 2008, "Control Architectures for a Powered Ankle Foot Orthosis," *International Journal of Assistive Robotics and Mechatronics*, 9(2), pp. 2-13.

J7. Hollander, KW, Ilg, R, Sugar, TG, Herring, DE. 2006. "An Efficient Robotic Tendon for Gait Assistance." *ASME Journal of Biomechanical Engineering*, 128(5), pp. 788-791, October.

J6. Hollander, KW and Sugar, TG. 2006. "Design of Lightweight Lead Screw Actuators for Wearable Robotic Applications." *ASME Journal of Mechanical Design*, 128(5), pp. 644-648, May.

J5. Engsborg, JR, Lenke, LG, Hollander, KW, Urich, ML, Commean, PK, Lee, JR, Bae, KT. 2003. "Methods to Locate Center of Gravity in Scoliosis". *Spine*, 28(23), pp. E483-489, December.

J4. Hampton, DA, Hollander, KW, Engsborg, JR. 2003. "Equinus Deformity as a Compensatory Mechanism For Ankle Plantarflexor Weakness." *Journal of Applied Biomechanics*, 19(4), pp. 325-339.

### **JOURNAL PUBLICATIONS - Continued**

J3. Engsberg, JR, Lenke, LG, Reitenbach, AK, Hollander, KW, Bridwell, KH, Blanke, K. 2002. "Prospective Evaluation of Trunk Range of Motion in Adolescents with Idiopathic Scoliosis Undergoing Spinal Fusion Surgery." *Spine*. 27(12), pp.1346-1354.

J2. Engsberg, JR, Wagner, JM, Reitenbach, AK, Hollander, KW, Standeven, JW. 2001. "A Measure of Motor Control at the Knee in Cerebral Palsy." *Journal of Applied Biomechanics*. 17(4), pp.335-343.

J1. Engsberg, JR, Ross, SA, Hollander, KW, Park, TS, 2000, "Hip Spasticity and Strength in Children with Spastic Diplegia Cerebral Palsy", *Journal of Applied Biomechanics*, 16(3), pp. 221-233.

### **CONFERENCE PUBLICATIONS/PRESENTATIONS**

C32. Sugar, TG, Hollander, KW, and Redkar, S, 2016, "HeSA, Hip Exoskeleton for Superior Assistance", WeRob 2016, Proceedings of the International Workshop on Wearable Robotics, La Granja, Segovia, Spain, October.

C31. Churchwell, R, Hollander, KW and Theisen, C, 2015, "The Use of Additive Manufacturing to Fabricate Structural Components for Wearable Robotic Devices", ASME IDETC 2015, DETC2015-47448, Boston, MA, August.

C30. Hollander, KW, Ward, JA and Sugar, TG, 2014, "Comparison of Exoskeleton Ankle Assistance to Downhill Walking Energetics and Biomechanics", WeRob 2014, Proceedings of the International Workshop on Wearable Robotics, Baiona, Spain, September.

C29. Hollander, KW, Ward, JA and Sugar, TG, 2014, "Comparison of Exoskeleton Ankle Assistance to Downhill Walking Energetics and Biomechanics", WeRob 2014, Proceedings of the International Workshop on Wearable Robotics, Baiona, Spain, September.

C28. Hollander, KW, Cahill, N, Holgate, R, Churchwell, RL, Clouse, PC, Kinney, D, Boehler, A, and Ward, J, 2014, "A Joint Torque Augmentation Robot (JTAR) for Ankle Gait Assistance", ASME IDETC 2014, DETC2014-35653, Buffalo, NY, August.

C27. Hollander, KW, Cahill, N, Holgate, R, Churchwell, RL, Clouse, PC, Kinney, D, and Boehler, A, 2014, "A Passive and Active Joint Torque Augmentation Robot (JTAR) for Hip Gait Assistance", ASME IDETC 2014, DETC2014-35654, Buffalo, NY, August.

C26. Hollander, KW, Clouse, P, Cahill, N, Boehler, A, Sugar, TG, Ayyar, A, 2012, "Design of the Orthotic Load Assistance Device (OLAD), Dynamic Walking, Pensacola, FL.

C25. Sugar, TG, Hollander, KW and Hitt, JK, 2011, "Walking with Springs", Proceedings of SPIE 7976, San Diego, California, March.

**CONFERENCE PUBLICATIONS/PRESENTATIONS - Continued**

C24. Hitt J, Merlo, J, Johnston, J, Holgate, M, Boehler, A, Hollander, KW, and Sugar, TG, 2010, "Bionic Running for Unilateral Transtibial Military Amputees", 27th Annual Army Science Conference, Orlando, FL, Nov/Dec.

C23. Hitt, J, Brechue, W, Boehler, A, Ward, J, Hollander, KW, Sugar, TS, Audet, D and Kanagaki, G, 2010, "Dismounted Soldier Biomechanical Power Regeneration", 27th Annual Army Science Conference, Orlando, FL, Nov/Dec.

C22. Hollander, KW, 2010, "Compliant Jack Spring™ Actuators for Lower Limb Mobility", National Science Foundation (NSF) Grantee Conference, Baltimore, MD, May.

C21. Hollander, KW, Werner, M, Boehler, A, Sugar, TG, 2010, "Powered Bionic Ankle with Regenerative Kinetics, the RT Ankle", Proceedings of the 36th Academy Annual Meeting & Scientific Symposium, American Academy of Orthotists and Prosthetists (AAOP), Chicago, IL, February 24 - 27.

C20. Beebe, E, Hollander, KW, Komm, DS, Springer, T, 2009, "Non-destructive examination techniques of plastics", Proceeding of the ASME Early Career Technical Conference, Arlington, TX, April.

C19. Holgate, M, Hitt, J, Bellman, R, Sugar, TG, Hollander, KW, 2008, "The SPARKy (Spring Ankle with Regenerative Kinetics) Project: Choosing a DC Motor Based Actuation Method", IEEE International Conference on Biomedical Robotics and Biomechatronics (BIOROB2008), Scottsdale, AZ, October.

C18. Komm, DS, Hollander, KW, Beebe, EA, McSpadden, HJ, 2008, "Steps Used to Analyze the Failure of an Exterior Suspended Ceiling," International Symposium on Safety Science and Technology (2008ISSST), Beijing, China, September.

C17. Boehler A, Hollander K, Sugar T, Shin D, 2008, "Design, Implementation and Test Results of a Robust Control Method for a Powered Ankle Foot Orthosis (AFO)", IEEE International Conference on Robotics and Automation (ICRA2008), Pasadena, CA, May.

C16. Hitt, J, Bellman, R, Holgate, M, Sugar, TG, Hollander, KW, 2007, "The SPARKy (Spring Ankle with Regenerative Kinetics) Project: Design and Analysis of a Robotic Transtibial Prosthesis with Regenerative Kinetics", #DETC2007-34512, ASME International Design Engineering Technical Conference (IDETC2007), Las Vegas, NV, September.

C15. Hollander, KW, Sugar, TG. 2007. "A Robust Control Concept for Robotic Ankle Gait Assistance" International Conference of Rehabilitation Robotics (ICORR2007), Noordwijk, Netherlands, June.

**CONFERENCE PUBLICATIONS/PRESENTATIONS (Continued)**

C14. Hitt, J, Oymagil, AM, Sugar, T, Hollander, K, Boehler, A, Fleeger, J., 2007. “Dynamically Controlled Ankle-Foot Orthosis (DCO) With Regenerative Kinetics: Incrementally Attaining User Portability.” IEEE International Conference on Control and Automation (ICRA2007), Roma, Italy, April.

C13. Hollander, KW, Sugar, TG, Herring, DE. 2005. “A Robotic ‘Jack Spring’ for Ankle Gait Assistance.” #DETC2005-84492, ASME International Design Engineering Technical Conference (IDETC2005), Long Beach, CA, September.

C12. Hollander, KW and Sugar, TG. 2005. “Design of Lead Screw Actuators for Wearable Robotic Applications.” #DETC2005-84595, ASME International Design Engineering Technical Conference (IDETC2005), Long Beach, CA, September.

C11. Hollander, KW, Sugar, TG, Herring, DE. 2005. “Robotic ‘Jack Spring’ for Ankle Gait Assistance.” International Conference of Rehabilitation Robotics (ICORR2005), Chicago, IL, June.

C10. Hollander, KW, Sugar, TG. 2005. “Design of the Robotic Tendon.” Design of Medical Devices Conference (DMD2005), Minneapolis, MN, April.

C9. Bharadwaj, K, Hollander, KW, Mathis, C, Sugar, TG. 2004. “Spring over Muscle (SOM) Actuator for Rehabilitation Devices.” IEEE Engineering in Medicine and Biology Society (EMBS2004), San Francisco, CA, September.

C8. Hollander, KW, Sugar, TG. 2004. “Concepts for Compliant Actuation in Wearable Robotic Systems”, Invited Paper, US-Korea Conference on Science, Technology and Entrepreneurship (UKC2004), Research Triangle Park, NC, August.

C7. Standeven, JW, Engsborg, JR, Lefrak, SS, Wagner, JM, Hollander, KW, Cooper, JD. 2004. “Quantifying Pulmonary Function During Gait Using Video Motion Capture.” Gait and Clinical Movement Analysis Society (GCMAS2004), Lexington, KY, April.

C6. Wang, Z, Hollander, KW, Sugar, TG. 2003, “A Novel Omni-Directional Perturbation Platform.” Proceedings of Intelligent Robots and Systems (IROS2003), Las Vegas, NV, October.

C5. Engsborg, JR, Lenke, LG, Hollander, KW, Uhrich, ML, Comean, PD, Bae, KT. 2002. “Center of Gravity (COG) in Scoliosis.” Presented at the Scoliosis Research Society annual meeting. Seattle, WA

C4. Engsborg, JR, Lenke, LG, Hollander, KW, Uhrich, ML, Bridwell, KH. 2002. “Changes in Trunk Range of Motion following Anterior or Posterior Spinal Fusion in Adolescent Idiopathic Scoliosis.” Presented at the Scoliosis Research Society annual meeting. Seattle, WA



**CONFERENCE PUBLICATIONS/PRESENTATIONS (Continued)**

C3. Engsberg, JR, Lenke, LG, Hollander, KW, Reitenbach, AK, Bridwell, KH. September, 2001. "Trunk Motion in Adolescents Undergoing Scoliosis Spinal Fusion." Presented at the Scoliosis Research Society Annual Meeting. Cleveland, Ohio.

C2. Engsberg, JR, Ross, SA, Hollander, KW, Park, TS. September, 2000. "Hip Abductor/Adductor Spasticity and Strength in Children with and without Cerebral Palsy." Presented at the American Academy of Cerebral Palsy and Developmental Medicine Annual Meeting. Toronto, Canada.

C1. Wagner, JM, Engsberg, JR, Hollander, KW, Olree, KS. August, 1999. "A Method for Quantitative Analysis of Continuous Kinematic Gait Variables." Presented at the International Society of Biomechanics Convention. Calgary, Canada.

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