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**KIJU LEE, Ph.D.**

Department of Mechanical and Aerospace Engineering, Case Western Reserve University  
 10900 Euclid Avenue, Cleveland, Ohio 44106, USA  
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Nord Distinguished Assistant Professor of Case School of Engineering  
 Director, Distributed Intelligence and Robotics Laboratory (dirLAB)  
<http://case.edu/mae/robotics>

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**EDUCATION**

- Ph.D. 2008     **Mechanical Engineering**, Johns Hopkins University, Baltimore, MD, USA  
 Dissertation: Robots that Duplicate Themselves: Theoretical Principles and Physical Demonstrations  
 Advisor: Gregory S. Chirikjian, Ph.D.  
 Committee: Noah Cowan, Ph.D., and Edward Scheinerman, Ph.D.
- M.S.E. 2006     **Mechanical Engineering**, Johns Hopkins University, Baltimore, MD, USA  
 Advisor: Gregory S. Chirikjian, Ph.D.
- B.S.E. 2002     **Electrical and Electronics Engineering**, Chung-Ang University, Seoul, Korea  
 Thesis: 4-Legged Robot Design and Control  
 Advisor: Hong-Tae Jeon, Ph.D.

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**ACADEMIC AND PROFESSIONAL POSITIONS**

- 2012 – present   **Nord Distinguished Assistant Professor**. Mechanical and Aerospace Engineering, Case Western Reserve University, Cleveland, OH, USA
- 2008 – present   **Assistant Professor**. Mechanical and Aerospace Engineering, Case Western Reserve University (Fall 2011 and Fall 2013 on leave)
- 2015 – present   **Assistant Professor (Courtesy appointment)**. Pediatrics, School of Medicine, Case Western Reserve University
- 2013 – present   **Affiliated Core Investigator**, Applied Platform Technology (APT) Center at Louis Stokes VA Medical Center, Cleveland, Ohio
- 2003 – 2008     **Graduate Research Assistant**. Department of Mechanical Engineering, Johns Hopkins University
- 2006 – 2007     **Teaching Assistant**. Department of Mechanical Engineering, Johns Hopkins University
- 2002 – 2003     **Electrical Engineer**. Borim Industry, Daegu, Korea (Part-time)

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**SELECTED AWARDS, HONORS AND RECOGNITIONS**

- 2015            **Invited Participant**, National Academies Keck Futures Initiative Conference (NAKFI), Irvine, CA, USA, November 12-14, 2015
- 2007            **Creel Family Teaching Assistant Award**, Mechanical Engineering, Johns Hopkins University
- 2004            **Critic's Choice Award (1<sup>st</sup> Place)**, Art Robot Competition, Johns Hopkins University
- 2003 – 2005    **Graduate Study-Abroad Fellowship**, Korea Science and Engineering Foundation, \$60,000

## PATENTS & INVENTION DISCLOSURES

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- **Socio-Biosensors** by K. Lee (100%). *US Patent Allowed*. Invention Disclosure filed in February 2015, Provisional Patent filed in April 2015, and US Patent filed in April 2016
- **SIG-Blocks and TAG-Games** by K. Lee (100%) *US Patent Pending*. Invention Disclosure filed in April 2010, Provisional Patent filed in April 2011, and US Patent filed in April 2012
- **Advanced Twisted Tower Design for Applications in Robotics and Automation** by K. Lee (100%). Invention Disclosure filed on October 2016, Provisional Patent filed in April 2017
- **Robotic Intubation Device**. Y. Laker, X. Cheng, G. Jiang, and K. Lee, In preparation for Provisional Patent Filing, 2017
- **Actively Transformable Wheel Design with Passive Mechanism** by K. Lee (100%). Invention Disclosure filed on December 15, 2017

## PUBLICATIONS AND PRESENTATIONS

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*Graduate and undergraduate advisees are underlined.*

### Under Review (refereed journal articles):

- J1. Y. Liu and **K. Lee**, “A New Probabilistic Approach for Consensus Decision Making in Swarms of Primitive Artificial Agents” *IEEE Transaction on Robotics* (submitted on 4/4/2018)
- J2. X. Liu and **K. Lee**, “Fast Facial Expression Detection Algorithm based on Deep Learning Combined with Simple Image Filtration,” *IEEE Robotics and Automation Letters* (submitted on 2/24/2018)

### Refereed Journal Articles:

- J3. **K. Lee**, D. Jeong, R. Schindler, L. Hlavaty, S. Gross, and E. J. Short, “Tangible Interactive Games for Cognitive Assessment of Young Children: Design and Preliminary Evaluation,” *Frontiers in Pediatrics* (*in press – accepted on 4/3/2018*)
- J4. T. Liu, Y. Wang, and **K. Lee**, “Design, Fabrication, and Analysis of a Novel Origami-Inspired Robotic Mechanism,” *IEEE Robotics and Automation Letters*, Vol. 3, No. 1, pp. 116-123, January 2018 (presented at IROS 2017, September 25-28, Vancouver, Canada), DOI: 10.1109/LRA.2017.2733626
- J5. D. Jeong and **K. Lee**, “Design and Analysis of an Origami-Based Three-Finger Manipulator,” *Robotica*, Vol. 36, pp. 261-274, January 2018. DOI: 10.1017/S0263574717000340 (Featured on the journal cover)
- J6. **K. Lee**, D. Jeong, R. Cooper, and E. J. Short, “SIG-Blocks: Tangible Game Technology for Cognitive Assessment,” *Computers in Human Behavior*. September 2016. DOI: 10.1016/j.chb.2016.08.023
- J7. D. Jeong and **K. Lee**, “iSIG-Blocks: Interactive Creation Blocks for Tangible Geometric Games,” *IEEE Transaction on Consumer Electronics*. Vol. 61, Issue 4, pp. 420-428, November 2015. DOI: 10.1109/TCE.2015.7389795
- J8. B. Floyd and **K. Lee**, “Implementation of Vision-based Object Tracking Algorithms for Motor Skill Assessments,” *International Journal of Advanced Computer Science and Applications*. Vol. 6, Issue 6, 2015. DOI: 10.14569/IJACSA.2015.060639
- J9. F. Bellotti, B. Kapralos, **K. Lee**, and P. Moreno-Ger, and R. Berta, “Assessment in and of Serious Games: An Overview,” *Advances in Human-Computer Interaction*, Article ID 136864, 11 pages, 2013. DOI: 10.1155/2013/136864
- J10. **K. Lee**, M. Moses and G.S. Chirikjian, “Robotic Self-Replication in Structured Environments: Physical Demonstrations and Complexity Measures,” *International Journal of Robotics Research*, Vol. 27, Issue 3-4, pp. 387-401, March 2008. DOI: 10.1177/0278364907084982

- J11. **K. Lee** and G.S. Chirikjian, “Robotic Self-Replication from Low-Complexity Parts,” *IEEE Robotics and Automation Magazine*, Vol. 14, Issue 4, pp. 34-43, December 2007. DOI: 10.1109/M-RA.2007.908962 (Featured on the journal cover)
- J12. **K. Lee**, Y. Wang and G.S. Chirikjian, “A Lie-Theoretic Perspective on O(n) Mass Matrix Inversion for Serial Manipulators and Polypeptide Chains,” *Robotica*, Vol. 25, Issue 6, pp. 739-750, November 2007. DOI: 10.1017/S0263574707003852

### Book Chapters:

- B1. **C. Puehn**, **T. Liu**, **Y. Feng**, **K. Hornfeck**, and **K. Lee**, “Design of a Low-Cost Social Robot: Towards Personalized Human-Robot Interaction,” *Aging and Assistive Environments, Lecture Notes in Computer Science*, Vol. 8515, pp. 704-713, 2014. Selected papers from the HCII 2014 conference were invited for publication. DOI: 10.1007/978-3-319-07446-7\_67
- B2. **Y. Zhang**, **K. Hornfeck**, and **K. Lee**, “Adaptive Face Recognition for Low-Cost, Embedded Human-Robot Interaction,” *Advances in Intelligent Systems and computing*, Vol. 193, pp. 863-872, 2013. Selected papers from the International Conference on Intelligent Autonomous Systems 2012 were invited for this publication. DOI: 10.1007/978-3-642-33926-4\_83

### Conference Proceedings – Full-Paper Refereed Archival Conferences:

- C1. **X. Cheng**, **G. Jiang**, **K. Lee**, and L. N. Yehoshua, “IntuBot: Design and Prototyping of a Robotic Intubation Device,” *IEEE International Conference on Robotics and Automation (ICRA 2018)*, Brisbane, Australia, May 21-25, 2018 (40.6% acceptance rate)
- C2. **Y. Wang** and **K. Lee**, “3D-Printed Semi-Soft Mechanisms inspired by Origami,” *NASA/ESA Conference on Adaptive Hardware and Systems*, California Institute of Technology, Pasadena, CA, USA, July 24-27, 2017. DOI: 10.1109/AHS.2017.8046373
- C3. **D. Jeong** and **K. Lee**, “An Amphibious Robot with Reconfigurable Origami Wheels for Locomotion in Dynamic Environment,” in proceedings of *the International Mechanical Engineering Congress & Exposition (IMECE 2015)*, Houston, TX, November 13-19, 2015. DOI: 10.1115/IMECE2015-53081
- C4. **D. Jeong** and **K. Lee**, “Distributed Communication and Localization Algorithms for Homogeneous Robotic Swarm,” in proceedings of *the International Symposium on Distributed Autonomous Robotic Systems (DARS 2014)*, Daejeon, Korea, November 2014. Published in *Distributed Autonomous Robotic Systems*, Springer, Part IV, pp 405-418, 2016. DOI: 10.1007/978-4-431-55879-8\_28
- C5. **E. Vander-Hoff**, **D. Jeong**, and **K. Lee**, “OrigamiBot-I: A Thread-Actuated Origami Robot for Manipulation and Locomotion,” in proceedings of *the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2014)*, Chicago, IL, USA, September 2014, pp. 1421-1426. DOI: 10.1109/IROS.2014.6942743 (46% acceptance rate)
- C6. **K. Lee** and **D. Jeong**, “Memorix: A Tangible Game using iSIG-Blocks,” in proceedings of *IEEE Games, Entertainment, and Media Conference (GEM 2014)*, Toronto, Canada, October 22-24, 2014, pp. 85-92. DOI: 10.1109/GEM.2014.7048087
- C7. **C. Puehn**, **T. Liu**, **Y. Feng**, **K. Hornfeck**, and **K. Lee**, “Design of a Low-Cost Social Robot: Towards Personalized Human-Robot Interaction,” in proceedings of *International Conference of Human-Computer Interaction (HCII 2014)*, Crete, Greece, June 22-27, 2014. DOI: 10.1007/978-3-319-07446-7\_67
- C8. **G. Kaloutsakis**, **A. Reimer**, **D. Jeong**, and **K. Lee**, “Design and Evaluation of a Multi-Sensor Unit for Measuring Physiological Stressors of Medical Transport,” in proceedings of *ASME International Mechanical Engineering Congress & Exposition (IMECE 2013)*, San Diego, CA, November 15-21, 2013, DOI: 10.1115/IMECE2013-65435
- C9. **D. Jeong** and **K. Lee**, “InchBot: A Novel Swarm Microrobotic Platform,” in proceedings of *the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2013)*, Tokyo, Japan, November 2013, pp. 5565-5570. DOI: 10.1109/IROS.2013.6697163 (43% acceptance rate)

- C10. D. Jeong and K. Lee, “Directional RSS-Based Localization of Multi-Robot Applications,” in *proceedings of the 12<sup>th</sup> WSEAS International Conference on Signal Processing, Robotics, and Automation*, Cambridge, UK, February 20-22, 2013, ISBN: 978-1-61804-164-7, pp. 266-272
- C11. Y. Zhang, K. Hornfeck, and K. Lee, “Adaptive Face Recognition for Low-Cost, Embedded Human-Robot Interaction,” in *proceedings of the International Conference on Intelligent Autonomous Systems (IAS 2012)*, Jeju, Korea, June 26-29, 2012. DOI: 10.1007/978-3-642-33926-4\_83
- C12. D. Jeong, B. Floyd and K. Lee, “SmartBall: Toward Interactive Play for Infants,” in *proceedings of the Sixth International Conference on Tangible, Embedded, and Embodied Interaction (TEI 2012) Work-in-Progress*, Kingston, ON, Canada, February 19-22, 2012
- C13. B. Floyd, D. Jeong and K. Lee, “Geometric Games for Assessing Cognitive, Working Memory, and Motor Control Skills.” in *proceedings of the Sixth International Conference on Tangible, Embedded, and Embodied Interaction (TEI 2012) Work-in-Progress*, Kingston, ON, Canada, February 19-22, 2012
- C14. D. Jeong, E. Kerçi, and K. Lee, “TaG-Games: Tangible Geometric Games for Assessing Cognitive Problem-Solving Skills and Fine Motor Proficiency,” in *proceedings of the IEEE International Conference on Multisensor Fusion and Integration (MFI 2010)*, Salt Lake City, UT, September 5-7, 2010, pp. 32-37. DOI: 10.1109/MFI.2010.5604479
- C15. K. Lee and G. S. Chirikjian, “An autonomous Robot that Duplicates Itself from Low-Complexity Components,” in *proceedings of the IEEE International Conference on Robotics and Automation (ICRA 2010)*, Anchorage, Alaska, May 2010, pp. 2771-2776. DOI: 10.1109/ROBOT.2010.5509904 (41.6% acceptance rate)
- C16. D. Jeong, E. Kerçi, and K. Lee, “Sensor-Integrated Geometric Blocks: Towards Interactive Play-Based Assessment of Young Children,” in *proceedings of the International Workshop on Interactive Systems in Healthcare (CHI-WISH 2010)*, Atlanta, GA, April 10-11, 2010
- C17. K. Lee, G. Kaloutsakis and J. Couch, “Towards Social-Therapeutic Robots: How to Strategically Implement a Robot for Social Group Therapy,” in *proceedings of the IEEE International Symposium on Computational Intelligence in Robotics and Automation (CIRA 2009)*, Daejeon, Korea, December 15-18, 2009, pp. 60-65. DOI: 10.1109/CIRA.2009.5423241
- C18. K. Lee and G. S. Chirikjian, “Measures of Reliability and Task Complexity for Self-Replicating Robotic Systems,” in *proceedings of the International Conference on Advanced Robotics (ICAR 2007)*, Jeju, Korea, August 22-25, 2007, pp. 1029-1034
- C19. S. Eno, L. Mace, J. Liu, B. Benson, K. Raman, K. Lee, M. Moses, G.S. Chirikjian, “Robotic Self-Replication in a Structured Environment without Computer Control,” in *proceedings of the IEEE International Symposium on Computational Intelligence in Robotics and Automation (CIRA 2007)*, Jacksonville, FL, June 20-23, 2007, pp. 327-332. DOI: 10.1109/CIRA.2007.382902
- C20. A. Liu, M. Sterling, D. Kim, A. Pierpont, A. Schlothauer, M. Moses, K. Lee, G.S. Chirikjian, “A Self-Replicating Robot with Simplified Control,” in *proceedings of the IEEE International Symposium on Assembly and Manufacturing (ISAM 2007)*, Ann Arbor, MI, July 22-25, 2007, pp. 264-269. DOI: 10.1109/ISAM.2007.4288483
- C21. K. Lee and G.S. Chirikjian, “A New Perspective on O(N) Mass-Matrix Inversion for Serial Revolute Manipulators,” in *proceedings of the IEEE International Conference on Robotics and Automation (ICRA 2005)*, Barcelona, Spain, April 2005, pp. 4722-4726. DOI: 10.1109/ROBOT.2005.1570849 (45% acceptance rate)
- C22. K. Lee and G.S. Chirikjian, “O(N) Inversion of Mass-Matrix for Hyper-Redundant Manipulators and Polymer Chains,” in *proceedings of the MUSME 2005*, Uberlandia, Brazil, March 6-9, 2005
- C23. W. Park, D. Albright, C. Addleston, W.K. Won, K. Lee, G.S. Chirikjian, “Robotics Self-Repair in a Semi-Structured Environment,” in *proceedings of Robosphere 2004*, NASA, Ames, CA, November 9-10, 2004

#### Peer-Reviewed Abstracts, Presentations, and Posters:

- A1. **K. Lee**, **Y. Wang**, and **C. Zheng**, “Origami-inspired Semi-soft Robotic Hand: Design, Fabrication, and Validation,” The 55<sup>th</sup> Annual Technical Meeting of the Society of Engineering Science (SES 2018), October 10-12, 2018, Madrid, Spain (Abstract & Oral Presentation)
- A2. **Y. Liu** and **K. Lee**, “Evaluation on Radio-Based Wireless Communication Performance for Multi-Robot Applications: Design and Experiments,” IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Vancouver, Canada, September 24-27, 2017 (Poster)
- A3. **K. Lee** and C. Lee, “Wearable Sensors for Autonomous Assessment of Health Effect of Group vs. Individual Walking,” Changing Cities, Mykonos, Greece, June 26-30, 2017 (Abstract & Presentation)
- A4. **X. Cheng**, **G. Jiang**, Y. Laker, and **K. Lee**, “IntuBot: Robotic Endotracheal Intubation Device,” VA Research Week Bridging the Gap, Louis Stokes VA Medical Center in Cleveland, May 15-19, 2016 (Poster Presentation)
- A5. **K. Lee** and C. Lee, “Towards Autonomous Assessment of Health Effect of Group versus Individual Walking,” Walk21, Hong Kong, October 3-7, 2016 (Abstract, Presentation, & Panel Discussion)
- A6. **Y. Liu** and **K. Lee**, “Distributed Shape-Formation Control for Robotic Swarms and ROS-Based Simulations,” Late Breaking Results, IEEE/RSJ IROS 2016, Daejeon, Korea, October 9-14, 2016
- A7. **K. Lee**, “Robotics and Tangible Game Technologies for Cognitive Assessment and Rehabilitation,” *Workshop on Women in Robotics*, Robotics: Science and Systems, Rome, Italy, July 16, 2015. (Abstract & Presentation)
- A8. **D. Jeong** and **K. Lee**, “Dispersion and Line Formation in Artificial Swarm Intelligence,” *Collective Intelligence*, MIT, Cambridge, MA, June 10-12, 2014. (Abstract & Poster)
- A9. **K. Hornfeck**, **Y. Zhang** and **K. Lee**, “Philos: A Sociable Robot for Human-Robot Interactions and Wireless Health Monitoring,” *in the proceedings of the 27<sup>th</sup> Symposium on Applied Computing (SAC 2012)*, Riva del Garda, Italy, March 26-30, 2012, pp. 293-294. (Extended Abstract)
- A10. **D. Jeong** and **K. Lee**, “Quantitative Analysis of Muscle Activations and Real-time Simulations for Two Pitching Motions: Overhand Pitching and Sidearm Pitching,” *Biomedical Engineering Society Annual Meeting*, Hartford, CT, October 12-15, 2011. (Abstract & Poster)
- A11. **K. Lee**, **D. Jeong**, **B. Floyd**, R. Cooper, and E. Short, “Games for Automated Assessments of Cognitive and Fine-Motor Skills: Design and Preliminary Evaluation,” *The 5<sup>th</sup> Annual International Conference on Psychology*, Athens, Greece, May 30 – June 2, 2011. (Abstract & Presentation)
- A12. **K. Lee**, M. Moses, M. Kutzer, “Self-Replicating Robots for Space Exploration,” *AIAA 2<sup>nd</sup> Space Exploration Conference: Future Leaders Exhibition*, Houston, TX, December 4-6, 2006. (Abstract & Poster)
- A13. **K. Lee**, M. Moses, G.S. Chirikjian, “Robotic Self-Replication in Structured and Adaptable Environments,” *in proceedings of Robotics: Science and Systems Workshop on Self-reconfigurable Modular Robots*, Philadelphia, August 16-19, 2006. (Extended Abstract & Presentation)
- A14. **K. Lee** and G.S. Chirikjian, “An Autonomous Self-Replicating Robot in a Partially Structured Environment,” *AIAA Region I YPSE-06*, APL, JHU, Laurel, MD, November 2006. (Abstract & Presentation)

**Invited Talks:**

- T1. Invited Speaker for Society of Engineering Science (SES 2018), Track 2 – Frontiers in Engineering Science: Addressing Soft Robotics Challenges. Madrid, Spain, October 10-12, 2018. Title: “TBD”
- T2. Invited Speaker for Faculty Fridays, Panhellenic Council and Interfraternity Congress, October 27, 2017 Title: “Origami, Novel Design Inspiration for Next Generation Robotics.”
- T3. Invited Seminar Speaker, Department of Mechanical and Aerospace Engineering, Case Western Reserve University, October 13, 2017

Title: “Flexibility and Adaptability in Robotics: From Distributed Intelligent Systems to Origami-Inspired Robots”

- T4. Invited Speaker, CWRU/Tohoku Data Science for Life Science and Engineering Symposium, August 3, 2017  
Title: “SIG-Blocks: Tangible Game Technology for Cognitive Assessment”
- T5. Invited Speaker, Advanced Design & Manufacturing Cleveland, Medical Devices and Diagnostic Industry, Cleveland Convention Center, Cleveland, OH, March 30, 2017  
Title: “Social Robots for Healthcare and Biomedical Applications.”
- T6. Invited Seminar Speaker. General Robotics, Automation, Sensing and Perception (GRASP) Lab, University of Pennsylvania, Philadelphia, PA, March 25, 2016
- T7. Invited Seminar Speaker. International Center for Autism Research and Education (ICARE) Working Group Meeting & Luncheon, Case Western Reserve University, May 1, 2015  
Title: “Technologies for Sensing Children’s Cognitive and Social Behavior”
- T8. Invited Seminar Speaker. College of Public Health, Texas A&M University, College Station, TX, April 28, 2015  
Title: “Wearable Technologies for Sensing Health and Social Behavior”
- T9. Invited Lecturer. Provost Scholars Program at Case Western Reserve University, February 5, 2014  
Title: “Introduction to Robotics.”
- T10. Invited Seminar Speaker. Daegu Science High School, Daegu, Korea, November 8, 2014  
Title: “Distributed Intelligence and Robotics Research at Case Western Reserve University”
- T11. Invited Seminar Speaker. Ehwa Women’s University, Seoul, Korea, October 31, 2014  
Title: “TAG-Games: Tangible Geometric Games for Cognitive Assessment and Rehabilitation”
- T12. Invited Seminar Speaker. Goldbag Research Seminar, Bolton School of Nursing, Case Western Reserve University, October 18, 2010  
Title: “TAG-Games: Tangible Geometric Games for Assessing Cognitive Problem Solving and Fine Motor Proficiency”
- T13. Invited Seminar Speaker. OAI-CWRU Industry Day, Case Western Reserve University, October 14, 2010  
Title: “Robotics Technology for Healthcare Applications”
- T14. Invited Seminar Speaker. Department of Mechanical Engineering, Columbia University, New York, NY, March, 2008  
Title: “Robotic Self-replication: Complexity Measures and Physical Demonstrations”
- T15. Invited Seminar Speaker. MIT Computer Science and Artificial Intelligence Lab, Cambridge, MA, March, 2008  
Title: “Robotic Self-replication: Complexity Measures and Physical Demonstrations”
- T16. Invited Seminar Speaker. Department of Electrical and Electronics Engineering, Chung-Ang University, Seoul, Korea, August 2007  
Title: “Descriptive Framework and Complexity Measures for Self-Replicating Robotic Systems”

#### **Invited Workshops and Meetings:**

- W1. IEEE/RSJ International Conference on Intelligent Systems and Robots (IROS), Workshop on Folding in Robotics, Vancouver, Canada, September 28, 2017  
Title: “Design, Fabrication, and Robot Embodiment of Origami-inspired Mechanisms”
- W2. NSF 2016 Accelerating Innovation Research – Technology Translation (AIR – TT) Grantee Meeting & Technology Showcase, Atlanta, GA, June 6-8, 2016
- W3. Invited Workshop Participant. NSF-Sponsored Tracing Learning Across Time and Space Workshop, New York Hall of Science, NY, USA, July 20-22, 2015

- W4. Invited Workshop Presenter. Robotics: Science and systems, Workshop on Women in Robotics, Rome, Italy, July 16, 2015  
Title: “Robotics and Tangible Game Technologies for Cognitive Assessment and Rehabilitation.”

#### **CWRU’s Research ShowCASE:**

- S1. Distributed Intelligence and Robotics Lab, Booth Exhibition, April 20, 2018  
S2. Robots and Fun Games from Distributed Intelligence and Robotics Lab, Booth Exhibition, April 21, 2017  
S3. Y. Wang, T. Liu, and **K. Lee**, “Toward 3D Printable Origami-Inspired Robot Manipulator,” April 21, 2017  
S4. Y. Jiang, T. Liu, D. Hayosh, and **K. Lee**, “Philos: A Social Robotic Platform,” April 21, 2017  
S5. X. Cheng, G. Jiang, L. Yehoshua and **K. Lee**, “Self-Insertion Endotracheal Intubation Device,” April 21, 2017  
S6. Distributed Intelligence and Robotics Lab, Booth Exhibition, April 15, 2016  
S7. Distributed Intelligence and Robotics Lab, Booth Exhibition, April 17, 2015  
S8. D. Jeong, C. Puehn, S. Kothari, and **K. Lee**, “iSense: Socio-Biosensors,” April 17, 2015  
S9. D. Jeong and **K. Lee**, “OrigamiBots: Origami Robots for Locomotion and Manipulation,” April 17, 2015  
S10. E. Vender-Hoff, D. Jeong, and **K. Lee**, “OrigamiBot-I: A Thread-Actuated Origami Robot for Manipulation and Locomotion,” April 18, 2014

#### **Exhibitions:**

- E1. TWISTER Showcase, Cleveland Museum of Natural History, Cleveland, Ohio, November 15, 2017  
E2. Innovation Station, Innovation Summit at Case Western Reserve University, Cleveland, Ohio, October 26, 2015  
E3. Robots at Great Lakes Science Center (GLSC), Cleveland, Ohio, February 21, 2015

#### **Selected External Publicity:**

- M1. CNN Tech, This robot can flex like Origami, October 3, 2017  
<http://money.cnn.com/video/technology/2017/10/03/origami-robot.cnnmoney/index.html>  
M2. Cleveland.com, Soft, origami-inspired robot created by Case Western Reserve researcher could be revolutionary, October 2, 2017  
[http://www.cleveland.com/metro/index.ssf/2017/09/soft\\_origami-inspired\\_robot\\_cr.html](http://www.cleveland.com/metro/index.ssf/2017/09/soft_origami-inspired_robot_cr.html)  
M3. MIT Technology Review, This origami-bot is a lightweight take on a robot arm, September 27, 2017  
<https://www.technologyreview.com/the-download/608973/this-origami-bot-is-a-lightweight-take-on-a-robot-arm/>  
M4. WKSU, Case Western Professor creates origami-inspired robot, October 9, 2017  
<http://wksu.org/post/case-western-professor-creates-origami-inspired-robot#stream/0>  
M5. Science Daily, Unraveling how a brain works, block by high-tech block, November 17, 2016  
<https://www.sciencedaily.com/releases/2016/11/161117103709.htm>  
M6. Science Now, Research on SIG-Blocks and TAG-Games (NSF Award #. 1109270 & 1445012) was featured as one of the three projects highlighted in Episode 48  
<https://science360.gov/obj/video/6c5f3a36-6e11-402c-b042-15236e20d207/nsf-science-now-episode-48>  
M7. NSF Teaching and Learning Video Showcase, “TAG-Games for Cognitive Assessment and Training via Interactive Play.” May 2016  
<http://stemforall2016.videohall.com/presentations/655>

- M8. NSF Teaching and Learning Video Showcase, “SIG-Blocks: Towards Interactive STEM Learning,” May 2015  
<http://resourcecenters2015.videohall.com/posters/468>, May 2015
- M9. WVIZ/PBS IDEASstream featuring “Philos: A Social Robot for Elderly Healthcare” by Anne Glausser in December 2014  
<http://wviz.ideastream.org/news/meet-philos-a-robot-caregiver>
- M10. Baltimore Sun, “Robotic art: Is it talent or technology?” by Michael Stroh in December 2004

## GRANTS

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*Total research grant mount during the tenure-track appointment at CWRU: \$770,399*

*Total funding amount received as the lead/sole PI: \$645,774*

*Total federal funding amount received as the lead/sole PI: \$545,774*

### Current:

1. **NSF: Award No. 1445012.** “PFI: AIR-TT: SIG-Blocks: Tangible Game Technology for Cognitive Assessment and Rehabilitation on People with Traumatic Brain Injuries (TBI)”

Role: **PI**, Co-PI: M. Allan (Senior Licensing Officer, Tech Transfer Office, CWRU), Co-investigators: S. Heinz, R. Riechers (Cleveland VA Medical Center)

Amount: \$255,282 (9/15/2014 – 5/31/2018)

The above total amount includes the following three supplements:

**Supplement 1.** Research Experience for Undergraduates (REU) - Award No. 1540525. \$12,000

**Supplement 2.** Travel support for attending the NSF SBIR Phase II & AIR-TT Grantee meeting, \$5,517

**Supplement 3.** GOALI “Technology-assisted cognitive assessment and training in older adults,” \$39,500  
 Additional investigators: E. Madigan (Nursing, CWRU), G. Gilmore (Social Sciences & Psychology, CWRU), D. Shell (Breckenridge Village).

*Summary: This project focuses on translating integrated sensors and wireless communication technology previously developed under an NSF grant to address the needs of automated cognitive assessment and rehabilitation for veterans with mild TBI. The tangible game technology using the novel Sensor-Integrated Geometric (SIG)-Blocks is employed as an assessment/rehabilitation tool that can be personalized for each patient. The GOALI supplement supports testing SIG-Blocks on older adults.*

2. National Academies Keck Future Initiative (NAKFI) Grant. “Fostering Empathy and Improving Focus Through the Groove Enhancement Machine: Facilitating Sensorimotor Coordination and Cooperation Among Groups of Individuals”

Role: **Co-PI**, PI: Petr Janata (UC Davis), other Co-PIs: J. Berger (Stanford), S. Auerbach (U. Mass), A. Thomas (TAMU)

Amount: \$100,000 (7/1/2016-6/30/2018)

*Summary: The proposed research aims to prototype a system for enabling group music making using the concept of adaptive metronome. A seed idea group at the NAKFI 2015 conference collaboratively developed this proposal based on our group topic: Role of Music in Health and Education. This grant program was open to invited grant participants only. My role in this project is the technical development of the wearable device to capture motions and sound signals for collective music making.*

3. ACES+ Advance Opportunity Grant. “Origami: novel design inspiration for next generation robotics.”

Role: **PI**

Amount \$5,000 (04/01/2017 – 3/31/2018)



Summary: *This project aims to investigate novel 3D printable origami designs for potential applications in robotics and advanced manufacturing.*

4. Internal Grants from CWRU Internet-of-Things Internal Grant Competition

“Workshops for IoT-based smart firefighting in urban/suburban environments.” Role: **PI**, Amount: \$10,000 (3/1/2018 – 12/31/2018)

“Cleveland IoT center for smart and connected healthcare of aging population.” Role: **PI**, Amount \$15,000 (\$10,000 from CWRU and \$5,000 from Ohio Living Breckenridge Village) (3/1/2018 – 12/31/2018)

“Halt asthma exacerbations through connected healthcare.” Role: **Collaborator** (PI: K. Ross, \$10,000, 3/1/2018 – 12/31/2018)

**Completed:**

5. **NSF: Award No. 1109270.** “REESE: Sensor-enabled geometric blocks for early childhood education.”

Role: **PI**, Co-investigator: E. Short (Psychological Sciences, CWRU)

Amount: \$290,492 (8/1/2011 – 7/31/2014)

Summary: *SIG-Blocks and TAG-Games with associated software and hardware technologies for automated cognitive and behavior assessments have been developed. The developed technology has been tested on over 100 university students and 40 children aged between 4 and 8 for reliability and validity evaluation.*

6. **Clinical & Translational Science Collaborative (CTSC): Annual Pilot Award.** “Feasibility evaluation of a customizable social robot for behavioral assessment and intervention for children with autism spectrum disorders.”

Role: **PI**, Co-investigators: T. Frazier (Director, Cleveland Clinic Center for Autism)

Amount: \$50,000 (6/1/2012 – 5/30/2013)

Summary: *A low-cost social robot was developed aiming to serve as a means for social and behavioral therapy for children with autism spectrum disorders (ASD). The hardware prototype has been built and can interact with human users via vision (face tracking/recognition) and touch and generate a variety of gestures and facial expressions. The second prototype is currently being built addressing the needs by the target end-users.*

7. **Advanced Platform Technology Center (Cleveland VA Medical Center): Garverick Innovation Incentive Program.** “Wearable bio-social sensors for older veterans living in a community living center.”

Role: **PI**, Co-investigators: E. Madigan (Nursing, Case Western Reserve University (CWRU)), P. Geraldo (Medical Director, Cleveland VA Medical Center’s Community Living Center)

Amount: \$20,000 (1/15/2015 – 9/30/2015)

Summary: *This project aims to develop wearable socio-biosensors for older veterans to measure biobehavioral, environmental, and social data to examine their correlations and relative importance on health outcomes. This pilot project will develop the sensor technology and clinically evaluate on a small group of older veterans living in a Community Living Center at CVAMC.*

8. **Medevac Foundation International & CTSA KL2.** “Assessment of patients’ exposure to transport.”

Role: **Co-I**, PI: A. Reimer (Nursing, CWRU)

K. Lee portion \$14,625 (\$9,831 from Medevac and \$4,794 from CTSA KL2) (1/1/2012 – 12/31/2013)

Summary: *This study focused on assessing patient’s exposure to ground and air transport. I was responsible for technical development of multi-sensor units equipped with a humidity sensor, thermometer,*

*barometer, noise sensor, triaxial accelerometers, and triaxial gyroscopic sensors and graphical user interface. This grant was a result of pilot study under support of Reimer's KL2 grant (CTSA KL2 TR000440, PI: Davis). I laid technical groundwork through this initial collaboration.*

## TEACHING

**Teaching Interests:** Robotics, numerical methods, dynamics, mechatronics.

Courses taught in MAE department at CWRU during pre-tenure period:

Semester	Course Title	Enrollment	Credit Hrs
S 2018	EMAE 250: Computers in Mechanical Engineering	87	3
F 2017	EMAE 488: Advanced Robotics	4	3
F 2017	EMAE 398: Senior Project	29	3
S 2017	EMAE 250: Computers in Mechanical Engineering	79	3
F 2016	EMAE 398: Senior Project	24	3
F 2016	EMAE 488: Advanced Robotics	6	3
S 2016	EMAE 250: Computers in Mechanical Engineering	51	3
S 2016	EMAE 488: Advanced Robotics	18	3
F 2015	EMAE 250: Computers in Mechanical Engineering	74	3
S 2015	EMAE 250: Computers in Mechanical Engineering	65	3
S 2014	EMAE 250: Computers in Mechanical Engineering	87	3
F 2013	On leave	-	-
S 2013	EMAE 250: Computers in Mechanical Engineering	66	3
F 2012	EMAE 488: Advanced Robotics	11	3
S 2012	EMAE 250: Computers in Mechanical Engineering	56	3
F 2011	On leave	-	-
S 2011	EMAE 250: Computers in Mechanical Engineering	67	3
F 2010	EMAE 488: Advanced Robotics	9	3
S 2010	EMAE 250: Computers in Mechanical Engineering	47	3
F 2009	EMAE 689: Special Topics	6	3

### Course Description:

#### **EMAE 250 Computers in Mechanical Engineering** | Spring Semester

This course focuses on computational methods toward handling mechanical problems using MATLAB. Lectures are designed to prepare students to learn numerical methods and apply them to solve problems including finding roots, linear algebraic equations, optimization, curve fitting, and ordinary differential equations. Lab sessions are designed to teach students MATLAB coding skills. This course offers students hands-on experiences with a series of lab exercises and assignments that involve writing and executing computer programs based on algorithms. Lecture and lab materials are updated annually. This is an undergraduate course required for Mechanical Engineering and Aerospace Engineering majors.

#### **EMAE 488 Advanced Robotics** | Fall Semester

This course consists of two parts: 1) lectures focusing on up-to-date knowledge and theories on integrated and distributed robotic systems and 2) a team-based project to design, construction, and control a robot. Lecture topics include kinematics and dynamics of robotic manipulator, multi-body dynamical systems, control theories, sensor network, computational complexity, and design methods. The project topic changes each year. Previous

topics include: modular robots, reconfigurable robots, and origami robots. Up to three students may work as a team on an individual project throughout the semester to design, construct, and control a robot. This is an introductory graduate-level course, but highly motivated upper-level undergraduate students are also encouraged to take this course.

### EMAE 398 Senior Projects | Fall 2016

In this core course, students carry out a design or experimental project under a faculty supervisor individually or as a team. Requirements include periodic reporting of progress, a final oral presentation, and a written report.

#### Student Advising:

##### Ph.D. student (1 graduated, 2 current):

Name	Degree Year	Dissertation Title
Donghwa Jeong	2015	Distributed sensing, communication, and control for tangible games and robotics applications
Tao Liu	2014 - current	Design and control of cable-based robotic mechanisms for direct human-robot interactive applications <i>**Received \$2,500 Think[Box] student project fund</i>
Xiangyi Cheng	2015 – current	IntuBot: design, development, and evaluation of a novel robotic intubation device <i>**Received \$2,500 Think[Box] student project fund</i>
Chuanqi Zheng	2016 – current	Design and control of swarm robotic systems <i>**Received \$2,500 Think[Box] student project fund</i>

##### Thesis-option MS students (5 graduated, 5 current):

Name	Degree Year	Thesis Title
Kenneth Hornfeck	2011	A customizable socially interactive robot with wireless health monitoring capability
Yan Zhang	2011	Low-cost, real-time face detection, tracking and recognition for human-robot interactions
Beatrice Floyd	2012	Computer automation and vision-based tracking of the upper extremities, gaze, and objects for performance assessment
Christian Puehn	2015	Development of a low-cost social robot for personalized human-robot interaction
David Miranda	2018	MusicBlocks: design and evaluation of tangible music games for cognitive assessment and training
Yang Liu	2015 – current	SwarmBots: development of a microrobotic hardware platform and distributed control algorithms
Xiao Liu	2017 – current	Control algorithms for human-robot social interaction <i>**Received \$2,500 Think[Box] student project fund</i>
Daniel Hayosh	2017 – current	Development of a social robot
Matt Trowbridge	2018 – current	TBD

##### Non-thesis MS students with a project option (10 graduated):

Name	Period	Project Title
Kai Zhang	2012 – 2014	GUI design for smart seat sensor map system
Shuo Li	2012 – 2014	GUI design for smart seat sensor map system
Sahil Kothari	2013 – 2015	Design and prototyping of bio-social sensors

Zhongqiang Huang	2013 – 2015	Smart seat sensor map
Jianan Sheng	2013 – 2015	Adaptive behavioral algorithm for social robot based on human interaction
Tingting Xue	2014 – 2016	GUI development for a social robotic system
Qian Wang	2014 – 2016	Design and control of an origami robot
Gaojun Jiang	2014 – 2016	Vision-based navigation algorithm for a novel robotic intubation device
Pan Xie	2015 – 2017	Touch-based human-robot interaction
Yuqi Jiang	2016 – 2017	Design of a socially assistive robot

Ph.D. dissertation committee (10):

Brandon Rutter (PhD 2009, Advisor: Quinn), Richard Bachman (PhD 2009, Advisor: Quinn), Jeremy Marvel (PhD 2010, Advisor: Newmann), Kathryn Daltorio (PhD 2013, Advisor: Quinn), Mark Refrew (PhD 2015, Advisor: Cavusoglu), Brian Merletz (PhD 2015, Advisor: Quinn), Alexander Hunt (PhD 2015, Advisor: Quinn), Wei Li (PhD 2016, Advisor: Quinn), Nicholas Szczecinski (PhD 2017, Advisor: Quinn), Ryan Reyes (Current, Advisor: Triolo)

MS thesis committee (5):

Taoming Liu (MS 2010, Advisor: Cavusoglu), Alexander Boxerbaum (MS 2010, Advisor: Quinn), Nicole Doorly (MS 2010, Advisor: Quinn), David Chrzanowski (MS 2015, Advisor: Quinn), Scott Rubeo (MS 2017, Advisor: Quinn)

Departmental qualifying exam committee (7):

Zamir Zulkefli (2009), Craig J. Slyfield (2009), Alexander Hunt (2013), Nick Szczesinki (2014), Mark Nandor (S 2018), Shanel Pickard (S 2018), Fletcher Young (S 2018)

Other students advising activities and K-12 STEM educational activities (5):

Bolutife Ogunjobi (Visiting student, May-July 2010, ACES+ summer research student), Joseph Feng (Visiting student from Solon High School, Summer 2015 - 2017), Emily Hedlund (Visiting student from Hawken High School, Summer 2015), Magomed Kasumov (Visiting student from University of Akron, Summer 2015), Samia Menon (Visiting student from Hawken High School, Summer 2017)

**PROFESSIONAL SERVICE**

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**Conference, Editorial, and Review Committees:**

2018	Associate Editor, IEEE Robotics & Automation Letters – IROS
2018	Associate Editor, Ubiquitous Robotics 2018
2017	NSF Review Panels (2 times)
2017, 2018	International Program Committee, The Mediterranean Conference on Control and Automation (MED)
2016	Program Committee, International Symposium on Distributed Autonomous and Robotics Systems (DARS)
2016	NSF Panel
2013 – present	Associate Editor, International Journal of Advanced Robotic Systems: Mobile Robots and Multi-Robot Systems
2015	Session Chair, International Mechanical Engineering Congress and Exposition (IMECE)
2015	Program Committee, IEEE Games, Entertainment, and Media Conference

- 2015 Associate Editor, IEEE International Conference on Robotics and Automation
- 2015 Technical Program Committee, IEEE International Symposium on Robots and Human Interactive Communication
- 2014 Program Committee, International Symposium on Distributed Autonomous and Robotics Systems (DARS)
- 2014 Technical Program Committee, IEEE International Symposium on Robots and Human Interactive Communication
- 2014 Associate Editor, IEEE International Conference on Robotics and Automation
- 2014 Program Committee, IEEE Games, Entertainment, and Media Conference
- 2013 Program Committee, Mediterranean Conference on Control and Automation
- 2013 Associate Editor, IEEE International Conference on Robotics and Automation
- 2012 Guest Co-Editor, Special Issue on User Assessment in Serious Games and Technology-Enhanced Learning, Advance in Human-Computer Interaction Journal
- 2011 Program Committee, International Conference on Intelligence Robotics and Applications
- 2010 International Program Committee, International Conference on Intelligence Robotics and Applications
- 2010 NSF Review Panels (2 times)
- 2009 Session Chair, International Symposium on Computational Intelligence in robotics and Automation
- 2007 Session Chair, International Conference on Advanced Robotics

**Memberships:**

- IEEE (Institute of Electrical and Electronics Engineers)
- AIAA (American Institution in Aeronautics and Aerospace)
- ASME (American Society of Mechanical Engineers)

**Journal and Conference Paper Reviews:**

- Robomech Journal
- International Journal of Robotics Research
- IEEE Robotics and Automation Magazine
- Robotica
- Mechanism and Machine Theory
- IEEE International Conference on Intelligent Robots and Systems (IROS)
- IEEE International Conference on Robotics and Automation (ICRA)
- Journal of Circuits
- Systems and Computers
- Mechanism and Machine Theory
- IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)
- Book Chapter Review
- IEEE Transaction on Human Machine Systems
- IEEE International Symposium on Robot and Human Interactive Communication (RO-MAN)
- International Mechanical Engineering Congress and Exposition (IMECE)
- Robotics and Autonomous Systems

## **UNIVERSITY SERVICE**

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### **Department of Mechanical and Aerospace Engineering:**

2014 – present    BS/MS program faculty director  
2013 – 2015      Seminar Committee  
2010 – 2015      Graduate Committee  
2009              Graduate Admissions Committee  
2008              Undergraduate Committee

### **Case School of Engineering:**

2017 – present    EECS Faculty Search Committee  
2014 – 2016      CSE Graduate Studies Committee  
2013 – 2015      MAE Faculty Search Committee

### **University Service:**

- Hosted 3-hour hands-on sessions for high school students from Hawken School, December 6, 2016.
- Hosted lab visit for CWRU Provost Scholars, February 11, 2016.
- Hosted 1-day lab activities for 4 high school female students to gain hands-on experience in engineering.
- Faculty host, Women in Science and Engineering Roundtable (WISER), “Introduce a Girl to Engineering Day” in 2010, 2011 and 2012.
- Judge, Research ShowCASE in 2009, 2010, 2015, 2017, 2018