Kooktae Lee

CONTACT
INFORMATION

Department of Mechanical Engineering
New Mexico Institute of Mining and Technology
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RESEARCH
INTERESTS

Distributed Networked Control Systems, Multi-Agent Systems, Robotics, Uncertainty Quantification, Asynchronous Algorithm, Multi-Objective Optimization

APPOINTMENTS

Assistant Professor   **Aug. 2017 – Present**
Department of Mechanical Engineering,
New Mexico Institute of Mining and Technology, Socorro, New Mexico, USA

Postdoctoral Scholar   **Jul. 2016 – Jul. 2017**
Department of Mechanical & Aerospace Engineering,
University of California San Diego, La Jolla, California, USA

Postdoctoral Research Associate   **Aug. 2015 – Jul. 2016**
Department of Aerospace Engineering,
Texas A&M University, College Station, Texas, USA

EDUCATION

Texas A&M University, College Station, Texas, USA

Ph.D., Department of Aerospace Engineering,   **Aug. 2010 – Aug. 2015**
- Advisor: Dr. Raktim Bhattacharya
- Dissertation : Analysis of Large-Scale Asynchronous Switched Dynamical Systems

Korea University, Seoul, Republic of Korea

M.S., School of Mechanical Engineering,   **Mar. 2006 – Feb. 2008**
- Advisor: Dr. Woojin Chung
- Thesis: Improvement of Odometry Accuracy and Parking Control for a Car-Like Mobile Robot

Korea University, Seoul, Republic of Korea

B.S., School of Mechanical Engineering,   **Mar. 1998 – Feb. 2006**
- Honors in Mechanical Engineering
- Advisor: Dr. Yongchan Kim

HONORS AND
AWARDS

- **2015 Outstanding Ph.D. Graduate Student Award**, Aerospace Engineering 75th Anniversary & Annual Awards Banquet, Texas A&M University (2015)
- **2014 Best Paper Award**, Korea Robotics Society Annual Conference (KRoC) (2015)
- **Engineering Graduate Student Travel Grant**, Dwight Look College of Engineering, Texas A&M University (2015)
- **2015 ACC Student Travel Award**, American Control Conference (ACC), Chicago, Illinois, USA (2015)
- **Best Presentation in Session Award**, American Control Conference (ACC), Portland, Oregon, USA (2014)

- **IEEE Control Systems Society Student Travel Award**, IEEE American Control Conference (ACC), Portland, Oregon, USA (2014)
- **Aerospace Graduate Student Fellowship**, Texas A&M University (Spring 2013)
- **Honors in Mechanical Engineering**, Graduate School, Korea University (Spring 2006)
- **The BK (Brain Korea) 21 Scholarship**, Graduate School, Korea University (2006, 2007)
- **Research Scholarships**, Korea University (Fall 2005)
- **Honors Scholarships**, Korea University (Spring, Fall 2005)
- **Mechanical Engineering Semester High Honors**, Korea University (Fall 2004, Spring 2005)
- **Work-Study Scholarships**, Korea University (Fall 1998, Spring 1999)

ACADEMIC
EXPERIENCES

University of California, San Diego, San Diego, California, USA
Postdoctoral Scholar   **Sep. 2016 - Jul. 2017**
- Multi-Objective Optimization in Disaster Response Scenario
- Ergodic Trajectory using Optimal Transport

Texas A&M University, College Station, Texas, USA
Postdoctoral Research Associate   **Sep. 2015 - Aug. 2016**
- Distributed Networked Control Systems
- Asynchronous Algorithms
- Distributed Optimization
- Consensus of Multi-Agent Systems

Research Assistant, Aerospace Engineering   **Mar. 2012 - Aug. 2015**
- Advisor: Dr. Raktim Bhattacharya
- Uncertainty Propagation/Quantification
- Networked Control Systems
- Performance and Robustness Analysis of Stochastic Jump Linear Systems and Markov Jump Linear Systems
- Analysis of Massively Parallel Asynchronous Computing Algorithm

Teaching Assistant, Aerospace/Mechanical Engineering
- AERO 422-500: Active Controls for Aerospace Vehicles (Dr. Raktim Bhattacharya, Fall 2014 / Spring 2015)
- AERO 310-500: Aerospace Dynamics (Dr. Suman Chakravorty, Spring 2013)
- MEEN 357-501: Engineering Analysis for Mechanical Engineers (Dr. Richard Malak, Fall 2010 and Dr. Andrew Duggleby, Spring 2011)
- Teaching students during office hours / Grading quizzes, homeworks, and exams / Helping students for MATLAB programming

University of Notre Dame, Notre Dame, Indiana, USA
Visiting Scholar, Electrical Engineering   **Summer, 2014**
- Advisor: Dr. Vijay Gupta
- Probabilistic Uncertainty Analysis of Asynchronous Parallel Numerical Algorithms

Korea University, Seoul, Republic of Korea
Research Assistant, Mechanical Engineering   **Feb. 2006 - Feb. 2008**
- Advisor: Dr. Woojin Chung
- Experimental research of automatic parking control for a Car-Like Mobile Robot
- Developing Car-Like Mobile Robot using Micro-controller

- Trajectory tracking control and Improvement of odometry accuracy for a Car-Like Mobile Robot
- Motion planning for automatic parking control

Teaching Assistant, Mechanical Engineering
- Introduction to Electrical Engineering (Dr. Woojin Chung, Fall 2006)
- Microprocessor Programming (Dr. Woojin Chung, Spring 2007)
- Class Teaching / Writing Problem sets and Exams / Helping Term project

WORK EXPERIENCES

SAMSUNG Advanced Institute of Technology
Summer Intern **Summer, 2012**
- Control of Nano-scale printing head
- Data analysis and analytical programming

Energy System Laboratory, Texas A&M University
Student Worker **Summer, 2011**
- Supervisor: Dr. Baltazar-Cervan , JuanC
- Data Analysis for energy efficiency of residential and industrial buildings

SAMSUNG Electronics
Research and Development Engineer **Feb. 2008 - Jun. 2009**
- Hardware Development for television and monitor products
- Robust Design for product ejecting robot
- Temperature and Pressure Control for molding products

PROJECT INVOLVEMENT

AFOSR Award #FA9550-15-1-0071
Cloud Computing Based Robust Space Situational Awareness **2015 - 2016**

NSF Award #1439145
Asynchronous PDE Algorithms for Turbulent Flows at Exascale **2014 - 2016**
- CCF Division of Computer and Communication Foundations

NSF Award #1349100
Asynchronous Algorithms for Exascale Computing Systems **2013 - 2014**
- CCF Division of Computer and Communication Foundations

NSF Award #1016299
Uncertainty Management in Real-Time Embedded Control Systems **2012 - 2013**
- CNS Division of Computer and Network Systems

Korea Ministry of Commerce, Industry, and Energy Award
Vision-based Intelligent Steering System - Project as Core Part Operation **2005 - 2008**
- Research of automatic parking control for a Car-Like Mobile Robot

SKILLS

Programming & Software experiences:
- Languages – C/C++/Visual C++, Visual Basic, Python
- Libraries – OpenMP, MPI, CUDA, PyOpenCL, PyCUDA, OpenCV
- Software Tools – Microsoft Office, MATLAB, SIMULINK, LABVIEW, LaTeX
- Operating systems – Windows, Linux
- Optimization Tools – MOSEK

Instrumentations & Platforms:
- Robots – Pioneer 3-DX
- Sensors – 2D/3D Range Sensor (SICK LMS200), IMU, Infra-red sensor, Encoder, Optical sensor, Photoelectric sensor

- AVR – ATmega128 & ATMEL8051 (Microcontrollers)
- NI-DAQ (Data-measurement equipment)

PROFESSIONAL AND OTHER ACTIVITIES

Technical Program Committee
- *Track Chair* for Distributed systems and Robotics, IEEE Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON) 2019
- *Committee member* for Distributed systems and Robotics, IEEE Annual Information Technology Electronics & Mobile Communication Conference (IEMCON) 2019

Reviewer / Participated in reviewing
- Automatica (2015, 2016)
- IEEE Transaction on Automatic Control (2016, 2019)
- IEEE Transaction on Systems, Man and Cybernetics: Systems (2015)
- IEEE Transaction on Human-Machine Systems (2015)
- IEEE Transaction on Robotics (2017)
- IEEE Conference on Decision and Control (2016, 2017)
- IEEE CSS American Control Conference (2012 - 2018)
- IEEE Conference on Control Technology and Applications (2017)
- ASME Dynamic Systems and Control Conference (2014, 2019)
- IEEE International Conference on Robotics and Automation (2008)
- IEEE International Conference on Advanced Robotics (2007)
- IEEE International Conference on Control, Automation and Systems (2006, 2007)

Memberships
- IEEE Student Member (2013-2015)
- IEEE Young Professionals (2013-2019)
- IEEE Control Systems Society Member (2013-2019)
- IEEE Communications Society Member (2013-2015)

Texas A&M University, College Station, Texas, USA
- Registration Assistant, Volunteer, Texas Systems Day (Mar. 28, 2014)
- Volunteer, Texas A&M Physics & Engineering Festival (2012)
- Lab tour Volunteer, Aerospace Engineering Undergraduate Student (2012)
- Vice President, Texas A&M - Korea University Student Association (2011-2012)

PUBLICATIONS

Journal Articles

1. K. Lee and R. Bhattacharya, Effect of Asynchronous Communications on Stationary Solutions for Discrete-Time Multi-Agent Systems, 2019 (submitted).

2. B. Molley and K. Lee, Accurate Positioning of Quadrotor UAVs using a Wii Remote Camera and Signal Modulations for Outdoor Precision Landing, *New Mexico Journal of Science*, Vol. 52, No. 1, 2018.

3. K. Lee and R. Bhattacharya, Optimal Controller Switching for Resource-Constrained Dynamical Systems, *International Journal of Control, Automation and Systems*, 16, no. 3, pages 1323-1331, 2018.

4. K. Lee and R. Bhattacharya, Stability Analysis of Large-Scale Distributed Networked Control Systems with Random Communication Delays: A Switched System Approach, *Systems & Control Letters*, 85, pages 77-83, 2015.

5. K. Lee, A. Halder, and R. Bhattacharya, Performance and Robustness Analysis of Stochastic Jump Linear Systems using Wasserstein metric, *Automatica*, Vol. 51, pages 341-347, 2015.

6. A. Halder, K. Lee, and R. Bhattacharya, Optimal Transport Apporach for Probabilistic Robustness Analysis of F-16 Controllers, *Journal of Guidance, Control, and Dynamics*, pages 1-12, 2015.

7. K. Lee, C. Jung, D. Jung, and W. Chung, Accurate Calibration of Kinematic Parameters for Two Wheel Differential Drive Robots by Considering the Coupled Effect of Error Sources, *Journal of Korea Robotics Society*, Vol. 9, No 1, pages 39-47, 2014.

8. K. Yoo, K. Lee, C. Jung, and W. Chung, Convergence Analysis of Kinematic Parameter Calibration for a Car-Like Mobile Robot, *Journal of Institute of Control, Robotics and Systems*, Vol. 17, No 12, pages 1256-1265, 2011.

9. K. Lee, C. Jung, and W. Chung, Accurate Calibration of Kinematic Parameters for Two Wheel Differential Mobile Robots, *Journal of Mechanical Science and Technology*, Vol. 25, No 6, pages 1603-1611, 2011.

10. K. Lee, W. Chung, and K. Yoo, Kinematic parameter calibration of a Car-Like Mobile Robot to improve odometry accuracy, *Mechatronics*, Vol. 20, Issue 5, pages 582-595, 2010.

11. K. Lee, W. Chung and H. Chang, Improvement of odometry accuracy and parking control for a car-like mobile robot, *The Journal of Korea robotics Society*, Vol.3 No.1 pages 16-22, 2008.

Conference Papers

1. C. Dotson, G. Macias, and K. Lee, Energy-Balanced Leader-Switching Policy for Formation Rotation Control of Multi-Agent Systems inspired by Bird Flocks, *ASME Dynamic Systems and Control Conference (DSCC)*, (submitted).

2. K. Lee, A Stabilizing Control Algorithm for Asynchronous Parallel Quadratic Programming via Dual Decomposition, *ASME Dynamic Systems and Control Conference (DSCC)*, (submitted).

3. M. Hassanalian and K. Lee, Drone Stations in Airports for Fog Mitigation, Runway Inspection and Birds Strike Avoidance, *2019 AIAA Aviation and Aeronautics Forum and Exposition*, (submitted).

4. M. Hassanalian and K. Lee, Smart Cities and Organizing the Drones Applications in Urban Areas: N.E.ST (Networking, Efficient, Strategies), *2019 AIAA Aviation and Aeronautics Forum and Exposition*, (submitted).

5. K. Lee and R. Bhattacharya, On the Uniqueness of Stationary Solutions of an Asynchronous Parallel and Distributed Algorithm for Diffusion Equations, *Computing and Communication Workshop and Conference (CCWC)*, 2019 IEEE 9th Annual, 2019.

6. K. Lee, S. Martinez, J. Cortes, R. H. Chen, and M. B. Milam, Receding-Horizon Multi-Objective Optimization for Disaster Response, *American Control Conference (ACC)*, 2018.

7. K. Lee and R. Bhattacharya, On the Relaxed Synchronization for Massively Parallel Numerical Algorithms, *American Control Conference (ACC)*, 2016.

8. K. Lee, R. Bhattacharya, J. Dass, V. Sakuru, and R. Mahapatra, A Relaxed Synchronization Approach for Solving Parallel Quadratic Programming Problems with Guaranteed Convergence, *IEEE International Parallel and Distributed Processing Symposium (IPDPS)*, 2016. (acceptance rate: 23%)

9. K. Lee, R. Bhattacharya, and V. Gupta, A Switched Dynamical System Framework for Analysis of Massively Parallel Asynchronous Numerical Algorithms, *American Control Conference (ACC)*, pages 1095-1100, Chicago, Illinois, USA, 2015.

10. A. Halder, K. Lee, and R. Bhattacharya, A Dynamical System Pair with Identical First Two Moments But Different Probability Densities, *IEEE Conference on Decision and Control (CDC)*, Los Angeles, California, USA, 2014.

11. K. Lee and R. Bhattacharya, Optimal Switching Synthesis for Jump Linear Systems with Gaussian initial state uncertainty, *Dynamic Systems and Control Conference (DSCC)*, San Antonio, Texas, USA, 2014.

12. K. Lee, A. Halder, and R. Bhattacharya, Probabilistic Robustness Analysis of Stochastic Jump Linear System, *American Control Conference (ACC)*, pages 2638-2643, Portland, Oregon, USA, 2014.

13. A. Halder, K. Lee, and R. Bhattacharya, Probabilistic Robustness Analysis of F-16 Controller Performance: An Optimal Transport Approach, *American Control Conference (ACC)*, pages 5562-5567, Washington, D.C., USA, 2013.

14. C. Jung, K. Lee, and W. Chung, Accurate calibration of Systematic odometry errors for mobile robots, *In Proceeding of the Korean Society of Mechanical Engineers*, pages 1065-1068, 2010.

15. K. Lee and W. Chung, Calibration of Kinematic Parameters of a Car-Like Mobile Robot to Improve Odometry Accuracy, *In Proceeding of 2008 IEEE/RAS International Conference on Robotics and Automation (ICRA)*, pages 2546-2551, Pasadena, CA, USA, 2008.

16. K. Lee and W. Chung, Experimental Research of Car Parking Control using a RC Car, *In Proceeding of the 13th International Conference on Advanced Robotics (ICAR)*, pages 247-252, Jeju, Korea, 2007.

17. K. Lee, W. Chung, H. Chang, Improvement of odometry accuracy and Parking Control for a Car-Like Mobile Robot, *In Proceeding of the 2nd Korea robot conference*, pages 505-511, Korea, 2007.

18. S. Hong, J. Won, K. Lee, W. Chung, Backward Parking Motion Control of a Car with Passive Trailers, *In Proceeding of the 2nd Korea robot conference*, pages 519-523, Korea, 2007.

19. K. Lee, W. Chung, H. Chang, P. Yoon, Odometry Calibration of a Car-Like Mobile Robot, *In Proceeding of International Conference on Control, Automation and Systems (ICCAS)*, pages 684-689, Seoul, Korea, 2007.

20. D. Kim, W. Chung, K. Lee Collision-free Path Planning for a Car Parking Problem, *In Proceeding of the 3rd International Conference on Ubiquitous Robots and Ambient Intelligence (URAI)*, pages 321-326, Seoul, Korea, 2006.

21. K. Lee, D. Kim, W. Chung, H. Chang, P. Yoon Car Parking Control using a Trajectory Tracking Controller, *In Proceeding of SICE-ICCAS*, pages 2058-2063, Busan, Korea, 2006.

22. D. Kim, K. Lee, W. Chung, H. Chang, P. Yoon Parking Control of a RC Car by using a Trajectory Tracking Controller, *In Proceeding of 1st Korea robot conference*, pages 448-455, Jeju, Korea, 2006.