

Hai-Nguyen Nguyen

Ph.D., Mechanical Engineering

*Interactive & Networked Robotics Lab.
Seoul National University, Korea
✉ hann@ieee.org
http://hann.work*

Summary

Demonstrated working history in top research institutions in Vietnam and Korea. Strong research professional in controls and robotics with works published in top-tier journals/conferences and featured in media. Proficient in C++ and Matlab. Hand-on experience in developing robotic prototypes.

Education

- Feb. 2018 **Ph.D. Mechanical Engineering**, *Seoul National University*, Korea.
(Exp.) Thesis: Dynamics and Control of Quadrotor-based Aerial Manipulation Systems.
Advisor: Prof. Dongjun Lee, Department of Mechanical & Aerospace Engineering.
Committee: Prof. Frank C. Park (chair), Prof. Kyujin Cho, Prof. Hyosung Ahn, Prof. Kyungsoo Kim.
- Jun. 2008, **B.Eng. Mechatronics, M.Sc. Engineering Mechanics**, *Hanoi University of Science and Technology*, Vietnam.
Dec. 2010

Research Experience

- Sep. 2012 – **Graduate Researcher**, *Seoul National University*, Korea.
present Working in Interactive & Networked Robotics Laboratory (INRoL).
 - Developed a novel aerial platform (SmQ platform) to overcome the well-known issues of under-actuation of multi-rotor drones for aerial operation/manipulation. Provided theoretical framework for its modeling and control, combining high-level Lyapunov control design (to achieve trajectory tracking) with low-level constrained optimization (to comply with physical constraints). Results published in top-tier conference/journal ([IROS15](#), [TRO18](#)) and featured in media ([IEEE Spectrum](#), [Interesting Engineering](#)).
 - Designed a control framework to enable a quadrotor to operate a tool attached on it. Fully characterized the internal dynamics of the spatial quadrotor tool operation, which arises due to the under-actuation of the quadrotor ([IROS13](#), [Automatica15](#)).
 - Collaborated with Rodel Lab at SNU and developed a new control decode scheme for their underwater robot with tilting thrusters ([IJCAS17](#)).
- Sep. 2009 – **Permanent Researcher**, *Vietnam Academy of Science and Technology*, Vietnam.
present Joined Department of Mechatronics, Institute of Mechanics in Sep. 2009 and became permanent researcher from Mar. 2010. Co-developed software/hardware for a 6-DOF manipulator prototype for welding.
- Dec. 2007 – **Graduate Researcher**, *Hanoi University of Science and Technology*, Vietnam.
Aug. 2009 Studied at Department of Applied Mechanics. Developed an algorithm for generating symbolic models of tree-topology multibody systems and a formalism for multibody systems using null-space of Jacobian matrix.

Skills

- Coding C++/Python, Matlab/Maple/Processing, ROS.
- Hardware Quadrotors (AscTec, Pixhawk), 6-DOF manipulator, Haptic devices (Phantom, Force Dimension), Motion capture systems, MCUs (Arduino, Odroid).

Honors and Awards

- 2017 Best Video Award, Korea Robotics Society Annual Conference.
- 2015 Travel Award, IEEE/RSJ International Conference on Intelligent Robots & Systems.
- 2013 – 2015 Lecture & Research Scholarship, Seoul National University.
- 2013 Global Scholarship, Seoul National University.
- 2012 – 2016 BK Scholarship, Brain Korea 21 & 21 Plus Program, Korea Government.
- 2010, 2011 Exceptional Researcher (Stakhanovite Appellation), Institute of Mechanics.
- 2003 Merit-based Scholarship, Hanoi University of Science and Technology.
- 2002 First Prize in Physics, Annual Excellent Student Contest, Haiphong City.
- 2001 Third Prize in Biology, Annual Excellent Student Contest, Haiphong City.

Publications

- [1] **H-N. Nguyen**, S. Park, J. Park, and D. J. Lee. A novel robotic platform for aerial manipulation using quadrotors as rotating thrust generators. *IEEE Transactions on Robotics (T-RO)*, 2018. (to appear, IF: 4.036, Scimago: 84/4364 in Engineering)
- [2] **H-N. Nguyen**, C. Ha, and D. J. Lee. Mechanics, control and internal dynamics of quadrotor tool operation. *Automatica*, 61:289-301, 2015. (regular paper, IF: 5.451, Scimago: 16/4364 in Engineering)
- [3] J. Bak, **H-N. Nguyen**, S. Park, D. J. Lee, T. Seo, S. Jin, and J. Kim. Positioning control of an underwater robot with tilting thrusters via decomposition of thrust vector. *International Journal of Control, Automation and Systems (IJCAS)*, 15(5):2283-2291, 2017.
- [4] **H-N. Nguyen**, S. Park, and D. J. Lee. Aerial tool operation system using quadrotors as rotating thrust generators. In *Proc. IEEE/RSJ Int'l Conference on Intelligent Robots & Systems (IROS)*, pp. 1285-1291, 2015.
- [5] **H-N. Nguyen** and D. J. Lee. Hybrid force/motion control and internal dynamics of quadrotors for tool operation. In *Proc. IEEE/RSJ Int'l Conference on Intelligent Robots & Systems (IROS)*, pp. 3458-3464, 2013.
- [6] J. Kim, **H-N. Nguyen**, and D. J. Lee. Preliminary Control Design on Spherically-Connected Multiple-Quadrotor Manipulator System. In *Proc. Int'l Conference on Ubiquitous Robots and Ambient Intelligence (URAI)*, pp. 206-207, 2015.
- [7] S. Park, **H-N. Nguyen**, and D. J. Lee. Modeling and control of a spherically-connected multi-quadrotor tool system. In *Proc. ICROS Annual Conference*, pp. 496-497, 2015.
- [8] **H-N. Nguyen** and D. J. Lee. Coordinated rotation control of multiple rigid bodies in $SO(3)$. In *Proc. IEEE Int'l Conference on Control, Automation and Systems (ICCAS)*, pp. 1671-1673, 2013.
- [9] V-P. Dinh and **H-N. Nguyen**. A new approach using null space of Jacobian matrix in simulation of multibody dynamics. *Studies in Applied Electromagnetics and Mechanics*, 37:44-58, 2012.

Presentations

- [1] **H-N. Nguyen**, S. Park, J. Park, and D. J. Lee. Aerial Manipulation using Multiple Quadrotors as Rotating Thrusters: Experiment Results. In *Korea Robotics Society Annual Conference (KRoC)*, Gangwon, Korea, 2017. (Best Video Award)
- [2] **H-N. Nguyen**, S. Park, J. Park, and D. J. Lee. Spherically-connected 3-quadrotor (S3Q) platform for aerial manipulation: experimental validation. In *IEEE Int'l Conference on Control, Automation and Systems (ICCAS)*, Gyeongju, Korea, 2016. (poster section)
- [3] **H-N. Nguyen**, S. Park, and D. J. Lee, Aerial manipulation using spherically-connected multiple-quadrotor tool system, In *IEEE Int'l Conference on Robotics & Automation (ICRA)*, Seattle, WA, 2015. (poster section)
- [4] **H-N. Nguyen**, J. Kim, and D. J. Lee. Preliminary result on aerial tool operation using quadrotors as rotating thrust generators. In *Int'l Symposium on Distributed Autonomous Robotic Systems (DARS)*, Daejeon, Korea, 2014. (poster section)

Patents

- [1] D. J. Lee, **H-N. Nguyen** and H. Lee, "Aerial robot system based on multi-rotor for mechanical tasks," *Korea Patent No. 10-1614620-0000*, 2016.
- [2] D. J. Lee, **H-N. Nguyen** and S. Park, "Multi-link type working apparatus moved by thrust generating device," *US Patent Application No. 14/923,442*, 2015.
- [3] D. J. Lee, **H-N. Nguyen** and S. Park, "Multi-link type working apparatus moved by thrust generating device," *Korea Patent Application No. 10-2015-0024404*, 2015.

Peer Review

Journals IEEE Transactions on Robotics (2015, 2016, 2017), IEEE Robotics and Automation Letters (2017), Mechatronics (2017, 2018), Nonlinear Dynamics (2017), Aerospace Science and Technology (2018).

Conferences IEEE International Conference on Robotics & Automation (2015, 2016, 2017, 2018), IEEE/RSJ International Conference on Intelligent Robots & Systems (2014, 2016).

Media

2017 [Interesting Engineering](#), [IEEE Spectrum](#).

2015 [IEEE Spectrum](#).

Teaching Experience

Sep. 2013 – **Teaching Assistant**, *Seoul National University*, Korea.

- Jul. 2017
- (1) Control System I (Spring 2015, Spring 2016, Spring 2017).
 - (2) Control System II (Fall 2013, Fall 2014, Fall 2016).
 - (3) Robot Mechanics (Spring 2014, Spring 2016).