

Hai-Nguyen (Hann) Nguyen

Ph.D., Mechanical Engineering

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Summary

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

Education

- Feb. 2018 **Ph.D. Mechanical Engineering**, *Seoul National University*, Korea.
Thesis: Dynamics and Control of Quadrotor-based Aerial Manipulation Systems.
Committee: Prof. Frank C. Park (chair), Prof. Dongjun Lee (advisor), Prof. Kyujin Cho, Prof. Hyosung Ahn, and Prof. Kyungsoo Kim.
- Jun. 2008, **B.Eng. Mechatronics, M.Sc. Engineering Mechanics**, *Hanoi University of Science and Technology*, Vietnam.
Jan. 2011

Research Experience

- Apr. 2018 – **Research Associate**, *Imperial College London*, UK.
Present Working in Aerial Robotics Laboratory (ARL).
- Developed an autonomous quadrotor system equipped with a winch-tethered magnet that is capable of perching on and sliding along a vertical surface for inspection at close proximity. The first realization of a tethered quadrotor that can hover and perch vertically near infrastructure elements, enabling a variety of surface manipulation and repair tasks. Publicly demonstrated at EMPA, Zurich, Switzerland ([ICRA19](#)) and at Imperial College, UK ([ORCA Hub](#)).
 - Developed planning and control algorithm for an aerial grappling robot which is able to perch on a variety of surfaces including tree branches and pipelines ([RoboSoft19](#)).
- Sep. 2012 – **Graduate Researcher**, *Seoul National University*, Korea.
Feb. 2018 Worked in Interactive & Networked Robotics Laboratory (INRoL).
- Developed a novel aerial platform (SmQ platform) to overcome the well-known under-actuation issues of multi-rotor drones in 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) ([IROS15](#), [TRO18](#), [IEEE Spectrum](#), [Interesting Engineering](#)). Live demo to many experts in robotics visiting INRoL during 2015-2018.
 - 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](#)).
- Sep. 2009 – **Permanent Researcher**, *Vietnam Academy of Science and Technology*, Vietnam.
Aug. 2012 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.

Honors and Awards

- 2018 Outstanding Contribution in Reviewing, Mechatronics Journal, Elsevier.
- 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 Competition, Haiphong City.
- 2001 Third Prize in Biology, Annual Excellent Student Competition, Haiphong City.

Media

- 2019 Imperial College.
- 2017 Interesting Engineering, IEEE Spectrum.
- 2015 IEEE Spectrum.

Publications

- [1] **H. Nguyen**, B. Stephens, and M. Kovac. Aerial inspection at close proximity: a multi-modal mobility approach. 2018. (In preparation, ICRA video)
- [2] **H. Nguyen**, R. Siddall, B. Stephens, A. Navarro-Rubio, M. Kovac. A passively adaptive microspine grapple for robust, controllable perching. *IEEE International Conference on Soft Robotics (RoboSoft)*, 2019.
- [3] **H. 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)*, 34(2):353-369, 2018. (IF: 4.264, SJR: 100/6810 in Engineering)
- [4] **H. Nguyen**, C. Ha, and D. J. Lee. Mechanics, control and internal dynamics of quadrotor tool operation. *Automatica*, 61:289-301, 2015. (IF: 6.126, SJR: 20/6810 in Engineering)
- [5] J. Bak, **H. 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. (IF: 2.173, SJR: 713/6810 in Engineering)
- [6] **H. 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.
- [7] **H. 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.
- [8] **H. 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.

Patents

- [1] D. J. Lee, **H. 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. 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. Nguyen** and S. Park, "Multi-link type working apparatus moved by thrust generating device," *Korea Patent Application No. 10-2015-0024404*, 2015.

Presentations

- [1] **H. 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)*, 2017. (Best Video Award)
- [2] **H. 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)*, 2016. (poster)
- [3] **H. 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)*, 2015. (Late Breaking Results Session)
- [4] **H. 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)*, 2014. (poster)

Peer Review

- Journals IEEE Transactions on Robotics, IEEE Robotics and Automation Letters, Mechatronics, Nonlinear Dynamics.
- Conferences IEEE Int'l Conference on Robotics & Automation (2015-2019), IEEE/RSJ Int'l Conference on Intelligent Robots & Systems (2014-2019).

Skills

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

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).
- Mar. 2019 **Guest Lecturer**, *Imperial College London*, UK.
(1) Aircraft Systems Engineering and Unmanned Vehicle Technologies (Spring 2019).