

Hai-Nguyen (Hann) Nguyen

Ph.D., Mechanical and Aerospace Engineering

RIS, LAAS-CNRS
Toulouse, France
✉ hann@laas.fr
🌐 <http://hann.work>

Summary

Demonstrated working history at top research institutions across France, UK, Korea. Strong research professional in robotics and autonomous systems with works published in top-tier journals and conferences, featured in media and demonstrated in public. First-hand experience in developing integrated hardware-software prototypes and industry-grade products within fast-paced Dev-Ops environments in Silicon Valley.

Education

- Feb. 2018 **Ph.D. Mechanical & Aerospace Engineering**, *Seoul National University*, Korea
Thesis: Dynamics and Control of Quadrotor-based Aerial Manipulation Systems.
Advisory committee: Prof. Frank C. Park (chair), Prof. **Dongjun Lee** (main advisor), Prof. Kyujin Cho.
- Jul. 2008, **B.Eng. Mechatronics, M.Sc. Engineering Mechanics**, *Hanoi University of Science and Technology*, Vietnam
Jan. 2011
Topics: Symbolic models of multibody systems (B.Eng.) and a formalism for multibody systems using null-space of Jacobian matrix (M.Sc.). Advisor: Prof. Van-Phong Dinh.

Research Experience

- Jul. 2021 – now **Contract Research Scientist**, *National Centre for Scientific Research (CNRS)*, France
Joined Robotics and InteractionS (RIS) group in LAAS-CNRS. Focus on the development of the foundations necessary to realize advanced aerial manipulation capability with a strong emphasis on *robustness* and *dexterity*. Initiated research projects and related collaborations along this line include:
- Robustness aerial physical interaction**
- Developed an integrated framework for autonomous sensor placement with aerial robots [4], presenting a fully contained and accessible sensor placement robotic solution.
 - Co-developed an aerial manipulator with shared compliance [5] with a study on combining mechanical compliance from the design with electrical compliance from the control.
- Dexterous aerial manipulation**
- Co-developed a constrained Kalman filter for a cable-suspended aerial multirobot manipulator [2].
 - Co-developed an algorithm for motion planning of a large-size aerial skeleton system with lock mechanisms.
- Apr. 2018 – Apr. 2020 **Research Associate**, *Imperial College London*, UK
Worked in Aerial Robotics Laboratory (ARL).
- Developed an autonomous quadrotor system equipped with a winch-tethered magnet [2] 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. Live demos at EMPA, Switzerland ([NEST](#)), at Imperial College, UK ([ORCA](#)), at Blyth, UK ([ORE Catapult](#)) and to many visitors to ARL during 2019-2020. Featured in media ([Reuters TV](#), [BBC](#), [Energy Voice](#), [CNBC](#), [Insider UK](#)).
 - Developed planning and control algorithms [8] for an aerial grappling robot to perch on a variety of surfaces including tree branches and pipelines.

- Sep. 2012 – **Graduate Researcher**, *Seoul National University*, Korea
Feb. 2018 Worked in Interactive & Networked Robotics Laboratory (INRoL).
 - Developed a novel aerial platform (SmQ platform) [9, 12] 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). Live demo to expert visits in robotics visiting INRoL during 2015-2018. Featured in media ([IEEE Spectrum](#), [Interesting Engineering](#)).
 - Designed a control framework [11, 13] 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.
- Sep. 2009 – **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 and hardware for a 6-DOF manipulator prototype for welding.

Industry Experience

- Mar. 2020 – **Senior Robotic Engineer**, *Vimaan Robotics, Inc.*, CA, US (remote)
May 2021 Joined Autonomous Navigation Team in Santa Clara, CA (joined remotely due to the COVID-19 and visa delay). Focus on developing sensor fusion, control and planning algorithms for indoor autonomous robots, ranging from autopilot to mission generation.
 - Developing trajectory generation and motion control for a hybrid ducted-fan/multi-rotor drones.
 - Developed a range-aid feature for vision/inertia based state estimation, implemented on ECL/PX4 firmware and verified with existing flight data.
 - Designed and implemented a route optimization algorithm for multiple aerial vehicles with limited flight time.
- Sep. 2019 – **Robotic Consultant**, *Imperial Consultants (ICON)*, UK
Dec. 2019 Working with Uniper Energy on digitalization. Demonstrate and case study the use of autonomous flying robots for routine inspection and monitoring tasks at the power plants.

Teaching Experience

- May 2022 **Guest Lecturer**, *University of Twente*, Netherlands
(1) Control for UAVs (Spring 2022).
- Mar. 2020 **Teaching Assistant**, *Business School, Imperial College London*, UK
(1) Imperial Leadership in a Technology Driven World Programme (Sberbank).
- Mar. 2019 **Guest Lecturer**, *Imperial College London*, UK
(1) Aircraft Systems Engineering and Unmanned Vehicle Technologies (Spring 2019, Spring 2020).
- Mar. 2019– **Coach, UK STEM Ambassador**, *Shepherds Bush Library*, UK
May. 2019 (1) Code club (Python).
- 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).

Mentoring Experience

2021-2022 **RIS Group**, LAAS-CNRS, France

Mentoring interns at LAAS:

(1) Colomaban Le-Falher, "Development of a flexible perching mechanism with integrated sensors for aerial robots", Master thesis, INSA, Strasbourg.

(2) Leonardo Mouta Pereira Pinheiro, "Manipulating a cable-suspended object with multiple UAVs and environment contacts in 2D", Engineering thesis, Supaero, Toulouse.

(3) Arthur Lotz, "Development of a perching robot", Engineering internship, Estaca.

2018-2020 **Aerial Robotics Lab**, Imperial College London, UK

Mentoring PhD student:

(1) Brett Stephens, "Interactive control and motion planning strategies for aerial manipulators in industrial environments", PhD student at Imperial College London and visiting PhD student at LAAS-CNRS.

Mentoring master students:

(1) Bojia Mao, "Achieve Aerial Tensile Perching with Learning-Based Control Algorithm", Master thesis. Now Algorithm Engineer at Tencent.

(2) Ronglong Ye, "Design and Manufacturing of a Passive Adapted Grapple for UAV Perching System", Master thesis. Now Sales Manager at Woco Group.

(3) Alan Slatter, "Agile Tensile Perching with Micro Aerial Vehicles", Master thesis. Now Software Engineer at Amazon.

(4) Brett Stephens, "Development of an Autonomously Perching Quadrotor Platform", Master thesis at ETH Zurich (internship at Imperial College). Now Postdoc at Imperial College London.

Technical Experience

Coding C++/Python, Matlab/Maple, ROS/PX4, OpenCV/PCL, Git/Docker/Bash/SQL.

Robots Multi-rotor drones, Manipulators, Underwater robot, Haptic devices, Motion capture systems, ARM-based MCUs.

Sensors Distance (TFmini, Terabee), Depth camera (Realsense, Terabee), Mono IMU-Camera.

Techniques Nonlinear Control Theory, Motion planning, Constrained Optimization, State Estimation and Sensor Fusion, VIO/SLAM.

Media

2021 [Imperial College London](#).

2020 [Imperial College London](#), [Telegraph](#).

2019 [Reuters TV](#), [BBC](#), [Energy Voice](#), [CNBC](#), [Insider UK](#).

2018 [Imperial College London](#), [EMPA](#).

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

2015 [IEEE Spectrum](#).

Research Funding

Jan. 2020 – **Principal Investigator**, *ORCA Partnership Resource Fund, EPSRC (£164K)*, UK

Dec. 2020 Mixed-Reality Enhanced Telepresence for Remote Inspection and Monitoring with Multiple Aerial Robots. (later tranfered to Co-PI before leaving Imperial)

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.

Academic Services

Edited and reviewed more than **100 articles** since 2014.

- Assoc. Editor *Ubiquitous Robots* (2020, 2021),
IEEE Int'l Conference on Robotics & Automation (2023).
- Section Chair *Robotics: Science and Systems* (2019).
- Review *IEEE Transactions on Robotics*, *IEEE Robotics and Automation Letters*, *Mechatronics*, *Nonlinear Dynamics*, *IEEE Transactions on Industrial Electronics*.
IEEE Int'l Conference on Robotics & Automation (2015-now),
IEEE/RSJ Int'l Conference on Intelligent Robots & Systems (2014-now),
Robotics: Science and Systems (2023)

Invited Talks

- Dec. 2022 **ICube - Université de Strasbourg**, France
Empowering aerial robots with physical interaction capabilities.
- Sep. 2022 **Fulbright University**, Vietnam
Empowering flying vehicles with physical interaction capabilities:
from Control and Design perspectives.
- Dec. 2019 **Laboratory for Analysis and Architecture of Systems**, *CNRS*, France
Dynamics and Controls of Aerial Robots for Physical Interaction.
- Nov. 2018 **2030:A Martian Odyssey**, *Symposium for Extreme Habitats*, UK
Aerial Robotics for Infrastructures.
- Mar. 2018 **Dept. Applied Mechanics**, *HUST*, Vietnam
Introduction of Aerial Manipulation Systems.
- Jan. 2018 **Networked Robotic Systems Laboratory**, *NCKU*, Taiwan
Aerial Robotic Systems for Physical Interaction.

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.

Publications

Detailed citation at [Google Scholar Profile](#). Mentored-student authors are underlined. Latest rankings available in Jul. 2023.

- [1] **H. Nguyen**, B. Stephens, and M. Kovac. Aerial inspection at close proximity: a multi-modal mobility approach. 2023. (in preparation)
- [2] D. Sanalitra, **H. Nguyen**, J. Cortes, A. Franchi and S. Lacroix. State Estimation Improvement for a Cable-Suspended Aerial Multirobot Manipulator based on Constrained Kalman Filtering. 2023. (in preparation)
- [3] F. Hauf, B. B. Kocer, A. Slatter, **H. Nguyen**, O. K. F. Pang, R. Clark, E. Johns, and M. Kovac. Learning Tethered Perching for Aerial Robots. *IEEE International Conference on Robotics and Automation (ICRA)*, 2023. [**Rank B**]
- [4] B. Stephens^{*}, **H. Nguyen**^{*}, S. Hamaza, and M. Kovac. An integrated framework for autonomous sensor placement with aerial robots. *IEEE/ASME Transactions on Mechatronics (TMech)*, 28(1):38-49, 2023. (* equal contribution) [**Q1, IF 5.867**]
- [5] B. Stephens, L. Orr, B. B. Kocer, **H. Nguyen**, M. Kovac. An Aerial Parallel Manipulator with Shared Compliance. *IEEE Robotics and Automation Letters (RAL)*, 7(2):11902-11909, 2022. (with IROS presentation) [**Rank A, Q1, IF 4.321**]
- [6] S. Hamaza, A. Farinha, **H. Nguyen**, and M. Kovac. Sensor Delivery in Forests with Aerial Robots: A New Paradigm to Environmental Monitoring. *IROS Workshop on Perception, Planning and Mobility in Forestry Robotics (WPPMFR)*, 2020. (Best Paper Award)
- [7] D. Robb, M. Imtiaz Ahmad, C. Tiseo, S. Aracri, A. C. McConnell, V. Page, C. Dondrup, H. M. Taylor, P. Ardon, E. Pairet, L. J. Wilson, T. Semwal, **H. Nguyen**, H. Hastie, and K. Lohan. Robots in the danger zone: exploring public perception through engagement. *ACM/IEEE Int'l Conference on Human-Robot Interaction (HRI)*, 2020.
- [8] **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. (* equal contribution)
- [9] **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. [**Q1, IF 6.835**]
- [10] 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. [**Q2, IF 2.964**]
- [11] **H. Nguyen**, C. Ha, and D. J. Lee. Mechanics, control and internal dynamics of quadrotor tool operation. *Automatica*, 61:289-301, 2015. [**Q1, IF 6.15**]
- [12] **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. [**Rank A**]

- [13] **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. [**Rank A**]
- [14] V-P. Dinh and **H. 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. Nguyen**. Gathering spatially and temporally spreading data with aerial robots. *Journée des Jeunes Chercheurs et Jeunes Chercheuses en Robotique (JJCR)*, and *Journée GT2 UAV*, 2022.
- [2] **H. Nguyen**, B. Stephens, P. Zheng, and M. Kovac. Vertical-surface Inspection with Flying Robots. *RSS Workshop on Aerial Interaction and Manipulation: Unsolved Challenges and Perspectives*, 2019. (poster)
- [3] **H. Nguyen**, S. Park, J. Park, and D. J. Lee. Aerial manipulation using multiple quadrotors as rotating thrusters: experiment results. *Korea Robotics Society Annual Conference (KRoC)*, 2017. (Best Video Award)
- [4] **H. Nguyen**, S. Park, J. Park, and D. J. Lee. Spherically-connected 3-quadrotor (S3Q) platform for aerial manipulation: experimental validation. *IEEE Int'l Conference on Control, Automation and Systems (ICCAS)*, 2016.
- [5] J. Kim, **H. 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.
- [6] **H. Nguyen**, S. Park, and D. J. Lee, Aerial manipulation using spherically-connected multiple-quadrotor tool system, *IEEE Int'l Conference on Robotics & Automation (ICRA)*, 2015. (Late Breaking Results Session)
- [7] **H. Nguyen**, J. Kim, and D. J. Lee. Preliminary result on aerial tool operation using quadrotors as rotating thrust generators. *Int'l Symposium on Distributed Autonomous Robotic Systems (DARS)*, 2014. (poster)
- [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.